Robotics Domain Task Force Final Agenda ver.1.0.3 **robotics/2009-12-01**

OMG Technical Meeting - **Long Beach, CA, USA** -- Dec. 7-11, 2009

http://robotics.omg.org/

		TF/SIG				
		Host	Joint (Invited)	Agenda Item	Purpose	Room
Monday:						
12:00	13:00			**LUNCH**		Beacon Ballroom, 3rd Lvl, 4th FL
13:00	18:00			Architecture Board Plenary		Seaview C, Lower Lvl, 1st FL
16:00	17:00			**New work item discussion:** **Behavioral States and Instructions for Lifestyle Support Service** - Miwako Doi (Toshiba)	presentation and discussion	Harbor A, Lower Lvl, 1st FL
17:00	18:00			Free Discussion	discussion	
Tuesday: WG activites						
9:00	9:45			Robotics Steering Committee	Arrangement	Regency C, 3rd Lvl, 4th FL
10:00	12:00			Robotic Infrastructure WG (2h) - Noriaki Ando(AIST) and Beom-Su Seo (ETRI)	discussion	Regency C, 3rd Lvl, 4th FL
				Robotic Services WG(2h): - Su-Young Chi(ETRI),, and Toshio Hori(AIST)	discussion	Regency Club Brdrm, 16th FL
12:00	13:00			**LUNCH**		Beacon Ballroom, 3rd Lvl, 4th FL
13:00	18:00			Robotic Infrastructure WG (5h) - Noriaki Ando(AIST) and Beom-Su Seo (ETRI)	discussion	Regency C, 3rd Lvl, 4th FL
				Services WG(5h): - Su-Young Chi (ETRI), and Toshio Hori (AIST)	discussion	Regency Club Brdrm, 16th FL
Wednesday: WG activities and Robotics Plenary						
9:00	12:00			Robotic Services WG(3h) - Su-Young Chi and Toshio Hori	discussion	Regency D, 3rd Lvl, 4th FL
11:00	12:00	SysA		Safety Case for Operating Systems - Yutaka Matsuno and Shunpei Nakata (AIST)	presentation and discussion	Regency E, 3rd Lvl, 4th FL
12:00	14:00			**LUNCH and OMG Plenary**		Beacon Ballroom, 3rd Lvl, 4th FL
14:00	14:10	Robotics		Robotics-DTF Plenary Opening Session	Robotics plenary openning	Regency C, 3rd Lvl, 4th FL
14:10	15:00	Robotics		**Special Talk: Introduction to DDS** **- Rick Warren (RTI)**	presentation and discussion	
15:00	15:30	Robotics		Contact Reports: - Makoto Mizukawa(Shibaura-IT), and Young-Jo Cho(ETRI)	Information Exchange	
				Break (30min)		
16:00	17:00	MARS		**Joint Plenary with MARS:** **RTC Deployment and Dynamic Configuration RFP** - Noriaki Ando(AIST) and Beom-Su Seo (ETRI)	1st Review of RFP draft	Shoreline A, Lower Lvl, 1st FL
17:00	17:40	Robotics		WG Reports and Discussion (Service WG, Infrastructure WG)	presentation and discussion	Regency C, 3rd Lvl, 4th FL
17:40	17:50	Robotics		Robotics-DTF Plenary Wrap-up Session (Roadmap and Next meeting Agenda)	Robotics plenary wrap-up	
17:50				Adjourn plenary meeting		
17:50	18:00			Robotics WG Co-chairs Planning Session (Preliminary Agenda for next TM, Draft report for Friday)	planning for next meeting	Regency C, 3rd Lvl, 4th FL
18:00	20:00			**OMG Reception**		Beacon Ballroom, 3rd Lvl, 4th FL
Thusday: WG activity follow-up						
12:00	13:00			**LUNCH**		Beacon Ballroom, 3rd Lvl, 4th FL
13:00	18:00			Architecture Board Plenary		Seaview C, Lower Lvl, 1st FL
Satday						
8:30	12:00			AB, DTC, PTC		Seaview, Lower Lvl, 1st FL
12:00	13:00			**LUNCH**		Seaview Rotunda, Lower Lvl, 1st FL
Other Meetings of Interest						
Monday						
8:00	8:45	OMG		New Attendee Orientation		Regency C, 3rd Lvl, 4th FL
9:00	12:00	OMG		Model Interchange Interoperability Demonstration		Seaview C, Lower Lvl, 1st FL
9:00	12:00	OMG		Tutorial - Introduction to OMG's Modeling and Middlewere Specifications		Regency C, 3rd Lvl, 4th FL
13:00	17:00	OMG		Business Ecology Initiative (BEI) Seminar		Regency B, 3rd Lvl, 4th FL
18:00	19:00	OMG		New Attendee Reception (by invitation only)		Beacon Rotunda, 3rd Lvl, 4th
Tuesday						
7:30	9:00	OMG		Liaison ABSC		Regency D, 3rd Lvl, 4th FL
8:00	12:00	OMG		Terminology Services Information Day		Shoreline B, Lower Lvl, 1st
9:00	17:00	OMG		BPM-SOA Symposium		Regency B, 3rd Lvl, 4th FL
17:00	18:00	OMG		RTF-FTF Chair's Workshop		Harbor A, Lower Lvl, 1st FL
Wednesday						
9:00	17:00	OMG		BPM-SOA Symposium		Regency B, 3rd Lvl, 4th FL
9:00	17:45	OMG		Green Sustainability Information Day		Regency A, 3rd Lvl, 4th FL
9:00	16:30	OMG		MARTE Tutorial		Seaview B, Lower Lvl,
9:00	17:00	SA-PTF		System Assurance PTF		Regency E, 3rd Lvl, 4th FL
Thursday						
9:00	17:00	OMG		Cloud Interoperability Roadmap Workshop		Regency B, 3rd Lvl, 4th FL
9:00	17:00	SA-PTF		System Assurance PTF		Regency E, 3rd Lvl, 4th FL
9:00	17:00	SE-DSIG		System Engineering DSIG - SysML/Modelica		Regency D, 3rd Lvl, 4th FL

Please get the up-to-date version from http://staff.aist.go.jp/t.kotoku/omg/RoboticsAgenda.pdf

Minutes of the Robotics DTF Plenary Meeting

September 14-18, 2009

San Antonio, TX, USA

(robotics/2009-12-02)

Meeting Highlights

- We came to an agreement to submit 1st draft of "RTC deployment and Dynamic Reconfiguration RFP" at the upcoming Long Beach Meeting. [robotics/2009-09-12]
- We had Joint Plenary with MARS and made a discussion about "RTC deployment and Dynamic Reconfiguration RFP". [robotics/2009-09-20]
- During the discussion of "Robotic User Identification Service RFP", Robotic Data Framework becomes one of potential RFP item.
- New item proposal about map for navigation from JARA, AIST, Univ. of Tsukuba, and ETRI

List of Generated Documents

robotics/2009-09-01 Final Agenda (Tetsuo Kotoku)
robotics/2009-09-02 Washington DC Meeting Minutes [approved] (Geoffrey Biggs and Beom-Su Seo)
robotics/2009-09-03 Costa Rica Meeting Minutes [approved] (Tetsuo Kotoku)
robotics/2009-09-04 Steering Committee Presentation (Tetsuo Kotoku)
robotics/2009-09-05 Roadmap for Robotics Activities (Tetsuo Kotoku)
robotics/2009-09-06 Deployment and Configuration in OMG CORBA Component Model (Noriaki Ando)
robotics/2009-09-07 Ice features related to the component repository concept (Geoffrey Biggs)
robotics/2009-09-08 EJB Deployment Service (Seung-Woog Jung)
robotics/2009-09-09 OPRoS Deployment Service (Seung-Woog Jung)
robotics/2009-09-10 Directory Service (OSGi and Web Service) (MyungEun Kim)
robotics/2009-09-11 RTC Deployment and Dynamic Reconfiguration (Hyun Kim)
robotics/2009-09-12 Infrastructure WG Progress Report (Noriaki Ando)
robotics/2009-09-13 Review of User Identification Service Interface (Su-Young Chi)
robotics/2009-09-14 User Identification Service Sequence Diagram (**Toshio Hori**)
robotics/2009-09-15 OMG User Identification Service Interface (Su-Young Chi)
robotics/2009-09-16 Opening Presentation (Tetsuo Kotoku)
robotics/2009-09-17 Contact Report (Su-Young Chi)
robotics/2009-09-18 Wrap-up Presentation (Tetsuo Kotoku)
robotics/2009-09-19 Next Meeting Preliminary Agenda - DRAFT (Tetsuo Kotoku)
robotics/2009-09-20 Robotics-DTF Infrastructure WG Activity - MARS-Robotics Joint Plenary Presentation (Noriaki Ando)
robotics/2009-09-21 DTC Report Presentation (Tetsuo Kotoku)
robotics/2009-09-22 San Antonio Meeting Minutes - DRAFT (Yoshihiro Nakabo and MyungEun Kim)

Minutes
Monday, September 14, 2009, Directors, 3rd FL(A)
13:00 - 14:00 Steering Committee

Tuesday, September 15, 2009, Maverick A, Losoya Conf Ctr
13:10 - 13:20 Robotics DTF Plenary Meeting, Chair: Dr Kotoku, Quorum:4
Jointed Organizations: AIST, ETRI, JARA, Samsung, Shibaura-IT, Technologic Arts, Univ. of Tsukuba, Univ. of Electro-Communications

- Minutes takers: Yoshihiro Nakabo, Myung-Eun Kim
- Approval of Washington D.C minutes
  Approved: AIST(motion), JARA(second), shibaura-IT(white ballot)
- Approval of Costa Rica minutes
  Approved: AIST(motion), JARA(second), Univ. of Tsukuba(white ballot)

13:20 - 13:40 User Identification Service WG report

- Discussed the difference between Biometrics API and UIS API
- Sequence diagram of user identification
- Proposal of new item about map for navigation from JARA, AIST, Univ. of Tsukuba, and ETRI are interested
- Discussion on Korean patent concerns with robotic standards

13:40 - 14:00 Infrastructure WG report

- Related technical survey including CCM, Web service, Ice, EJB and OSGi
- Discussion about Use case for component deployment and dynamic reconfiguration
- The RFP title: RTC deployment and dynamic reconfiguration (tentative)
- Scope of the RFP: deployment & reconfiguration
- Draft RFP will be reviewed and discussed at the next two OMG meetings

14:30 - 14:50 Contact Report, Soo-Young Chi, ETRI

- Robot World Busan and URAI 2009 in Korea
- ETRI-AIST MOU on August 28, 2009
- Dr. Y. Chung proposed “user identification service APIs for intelligent service robot “ in ISO/IEC JCT1 1/SC24 London Meeting(2009.07)
- Prof. Bruce MacDonald applied for funding for NZ-Japan-Korea Joint Workshop in next year
- Meeting for IEEE standardization activity in Robotics between ETRI and IEEE-SA

Closing presentation and next agenda by Tesuo Kotoku

- Robotic Localization Services WG is continuing
- Call for volunteers
- Next meeting: December 7-11, Long Beach, CA, USA
- iREX2009 and SII2009 in Tokyo Japan

Adjourned plenary meeting at 15:05

ATTENDEE (15 Participants)

- Makoto Mizukawa (Shibaura-IT)
- Takashi Tsubouchi (Univ. of Tsukuba)
- Toshio Hori (AIST)
- Takeshi Sakamoto (Technologic Arts)
- Shuichi Nishio (JARA)
- Yeon-Ho Kim (Samsung)
- Su-Young Chi (ETRI)
- Myung-Eun Kim (ETRI)
- Hyun Kim (ETRI)
- Seung-Woog Jung (ETRI)
- Takashi Suehiro (UEC)
- Geoffrey Biggs (AIST)
- Noriaki Ando (AIST)
- Yoshihiro Nakabo (AIST)
- Tetsuo Kotoku (AIST)

Prepared and submitted by Yoshihiro Nakabo (AIST) and Myung-Eun Kim (ETRI).

TOSHIBA
Leading Innovation

NRF
Network Robot Forum

Behavioral States and Instructions for Lifestyle Support Service

Miwako Doi
TOSHIBA
Network Robot Forum

robotics/2009-12-03

The population of the world will be older.

World Population Prospects: The 2006 Revision

Figure 1: World population by age groups, 1950-2050

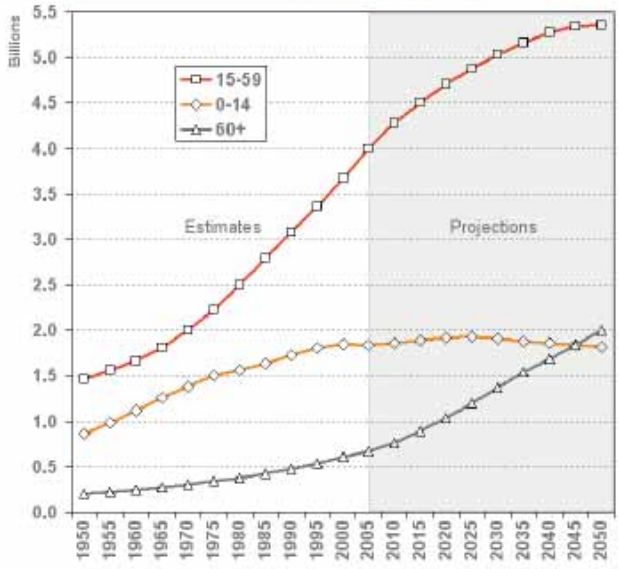
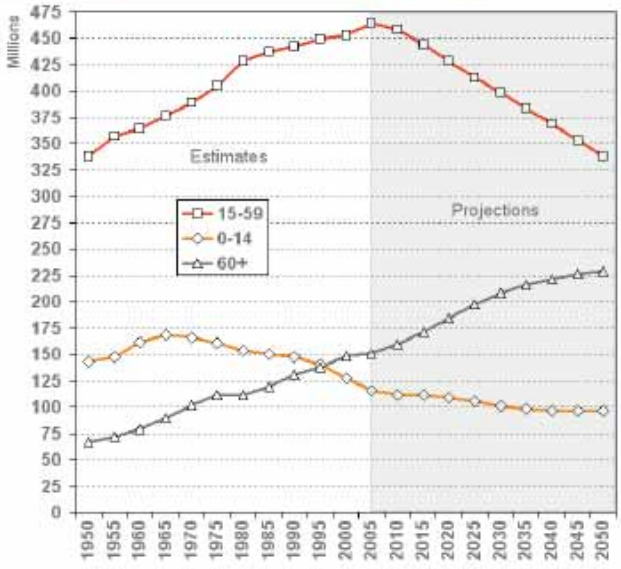


Figure 2: Europe's population by age groups, 1950-2050



cited from http://www.un.org/esa/population/publications/wpp2006/wpp2006_ageing.pdf

Figure 3: Asia's population by age groups, 1950-2050

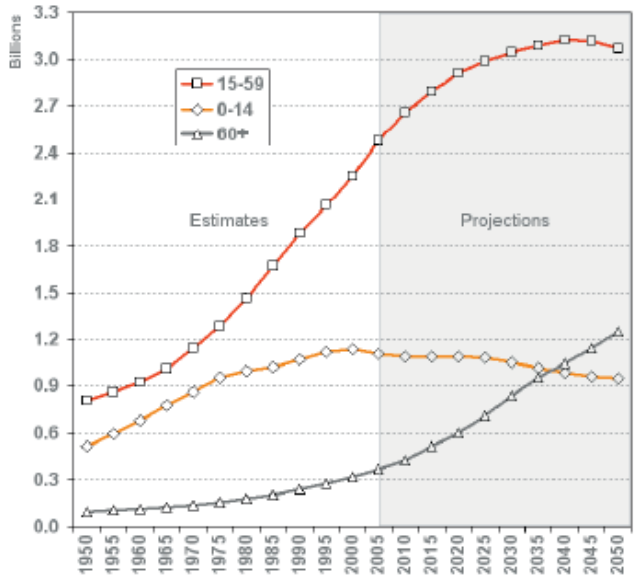
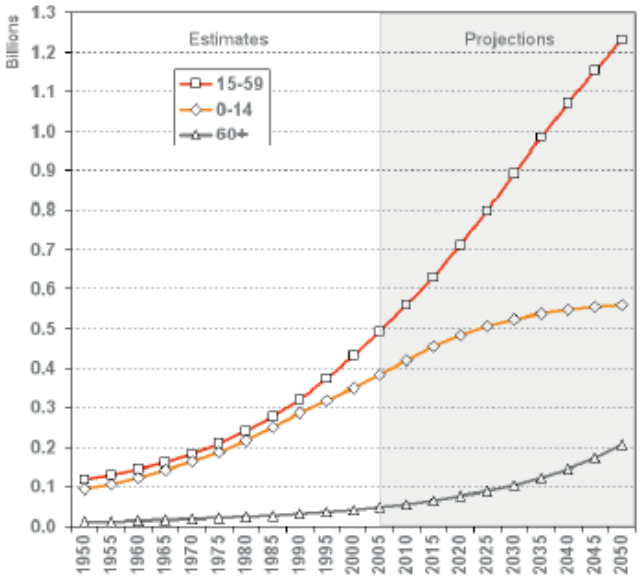


Figure 4: Africa's population by age groups, 1950-2050



cited from http://www.un.org/esa/population/publications/wpp2006/wpp2006_ageing.pdf

Figure 5: Latin America's population by age groups, 1950-2050

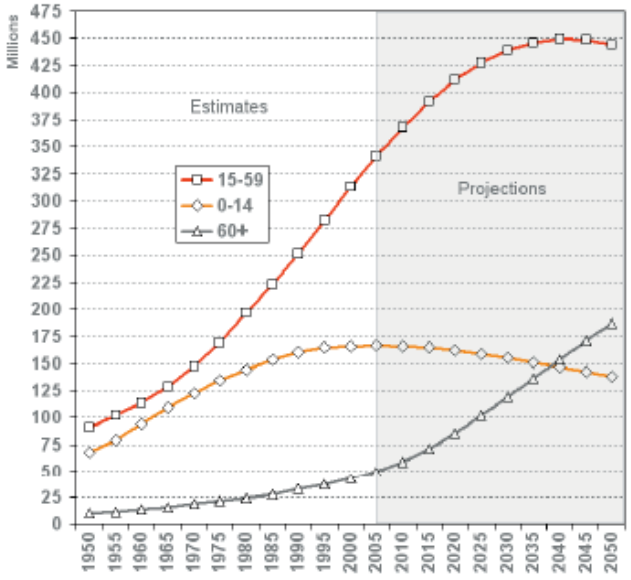
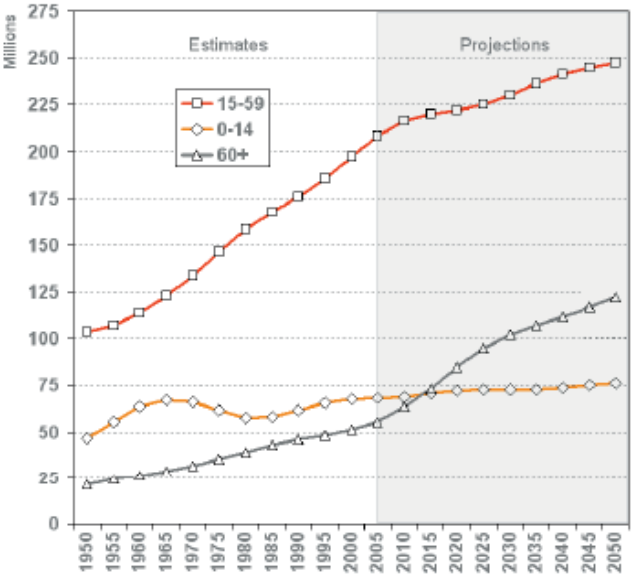


Figure 6: Northern America's population by age groups, 1950-



cited from http://www.un.org/esa/population/publications/wpp2006/wpp2006_ageing.pdf

Features of elder persons

- **Persons supported; support 4.9%, nurse care 24.7% over 75 years old in Japan**

→ Persons supporting; support 0.9%, nurse care 3.9% within 65-74 years old in Japan

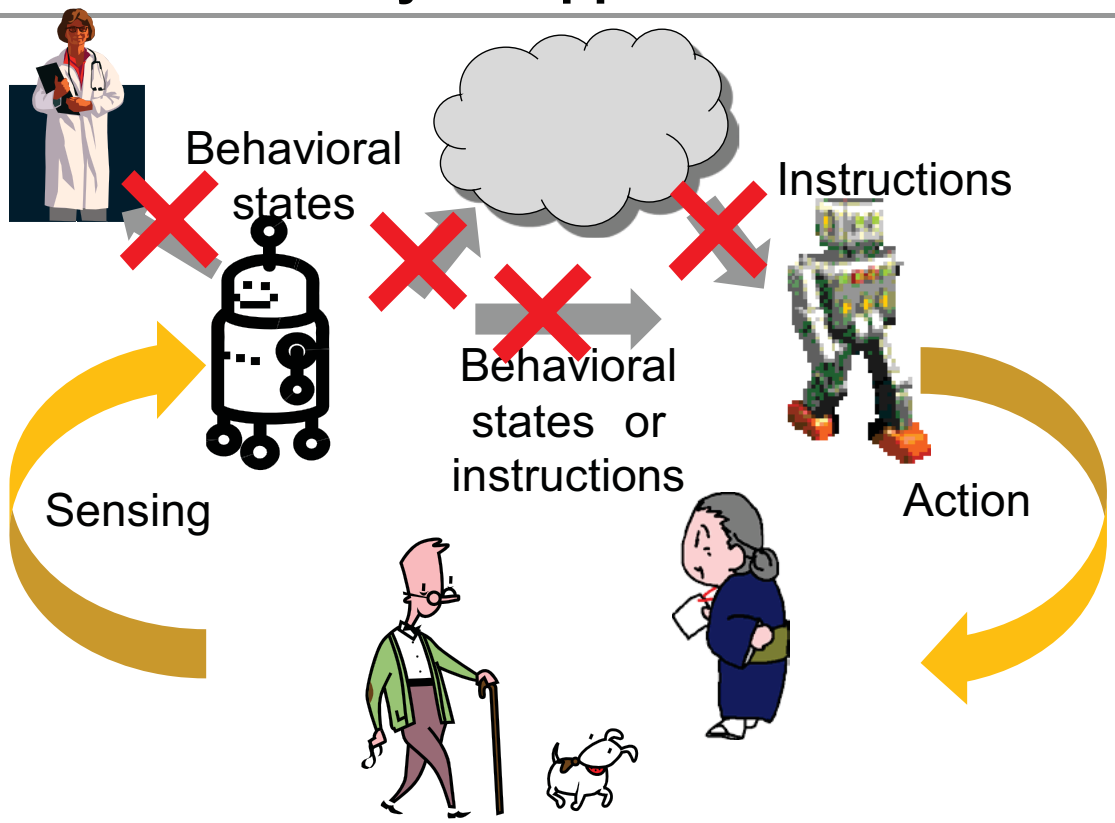
- **Increase of solitary elder person;**
  - male 4.3% female 11.2% in 1980 →male 9.7% female 19% in 2005
  - contact frequencies of estranged child more than one per week;
    Japan 46.8% USA 80.8% Germany 58.6% France 67.2% Korea 66.9%
- **Needs for existence value on society**
- **Big error for physical ability awareness**

(statics from white paper on aging society 2008 in Japan)

Needs for lifestyle support Networked Robots

- **Elder persons want to go out in order to require their existence value on society, but they can not walk around to their satisfaction.**
- **Robots will support the active elder persons cooperating with elder persons and other robots.**

Problems of **Lifestyle Support Service**



Instructions definitions

- **ORiN(Open Robot Interface for the Network)**
  - RAC: Robot Action Commands
- **RSi (Robot Service Initiative)**

ORiN RAC: Robot Action Commands

- **Top level: START, STOP, GET, PUT**

- Ex. Move Left arm(ARM1) to position(10,20)

START: ARM: 1: REACH:10,20

VB program

```
Dim raoEng as RaoEngine
Dim raoWS as RaoWorkspace
Dim WithEvents raoCtrl  as RaoController

Set raoEng = new RaoEngine
Set raoWS =raoEng.RaoWorkspaces(0)
Set raoCtrl=raoWS.OpenController("RaoProv.SUT.RAC)

raoCtrl.Execute "START: ARM: 1: REACH:10,20"
```


RSi Command

- **Forward**
- **Backward**
- **Right**
- **Left**
- **Spin right**
- **Spin left**
- **Stop**
- **Get_position_info**
- **Shake**
- **Shake2**
- **sensor**

Instructions definitions

- **ORiN(Open Robot Interface for the Network)**
  - RAC: Robot Action Commands
- **RSi (Robot Service Initiative)**

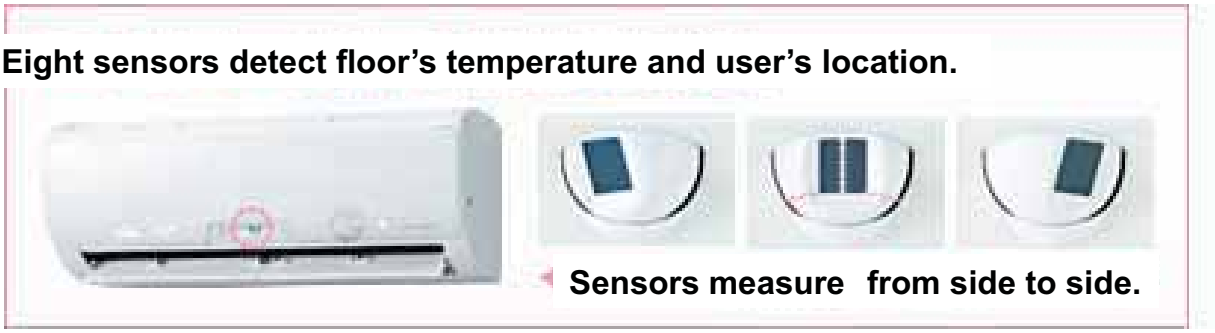
Instructions definitions must be scenario specific.

New trends of behavioral states

- **For energy saving**

The air conditioner with motion sensors estimates user's position and behaviors and controls its operation parameters.

ex. Panasonic's AirRobo, Mitsubishi's Move Eye, and so on.



Photos of Mitsubishi's MoveEye cited from http://www.mitsubishielectric.co.jp/home/kirigamine/09/moveeyefit/

New trends of behavioral states (continued)

- **For digital signage**

  The digital signage with a camera counts numbers, detects the face directions, estimates users' sexuality and age and change the displayed contents.

  ex. Oki's Signage Eye, NEC's eye flavor, and so on.

  Photo of NEC'x eye flavor cited from http://www.nec.co.jp/press/ja/0812/1601.html

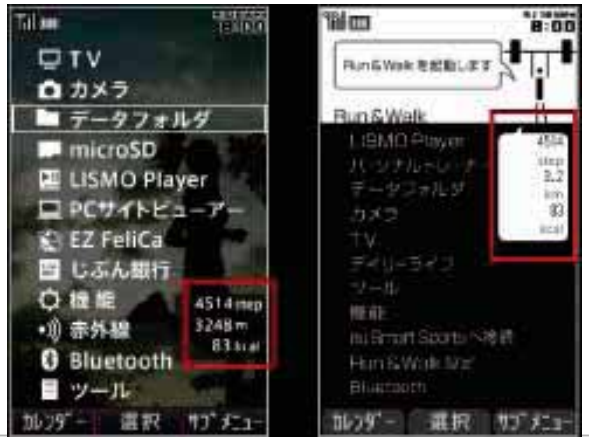
New trends of behavioral states (continued)

- **For health care**

  The mobile phone with a motion sensor measure walk count and calculates distances and calories-out.

  ex. au's Run&Walk, docomo's health care, and so on.

  Photo of W65T displays cited from http://www.toshiba.co.jp/product/etsg/cmt/au/w65t/w65t_menu.htm



New trends of behavioral states (continued)

- **For recommendation**

ISP delivers the information based on locations and behavior histories.

ex. docomo's i-concier service, and so on.

Photo of docomo's i-concier cited from http://answer.nttdocomo.co.jp/concier/index.html

Wii Fit

http://wii.com/jp/movies/wii-cm-soft208/

Examples of behavioral states

- **METs (Metabolic equivalents)**
- **ICF (International Classification of Functioning, Disability and Health)**
- **ADL (Activities of Daily Living)**
- **IAL (Instrumental Activities of Daily Living)**
- **BML (Behavioral Markup Language)**

Compendium of physical activities: an update of activity codes and METs (Metabolic equivalents) intensities

METs are defined by ACSM (American College of Sports Medicine)

cited from Ainsworth BE, et.al., Sci Sports Exerc. 20000, 32(9 Suppl):S498-504.

6230	4.5	home repair	washing fence,painting fence
6240	3.0	home repair	wiring,plumbing
7010	1.0	inactivity,quiet	lying quietly and watching television
7011	1.0	inactivity,quiet	lying quietly,doing nothing,lying bed awake,listening to musi talking or reading)
7020	1.0	inactivity,quiet	sitting quietly and watching television
7021	1.0	inactivity,quiet	sitting quietly,sitting smoking,listening to music(not talking reading),watching a movie in a theater
7030	0.9	inactivity,quiet	sleeping
7040	1.2	inactivity,quiet	standing quietly(standing in a line)
7050	1.0	inactivity,quiet	reclining - writing
7060	1.0	inactivity,quiet	reclining - talking or talking on phone
7070	1.0	inactivity,quiet	reclining - reading
7075	1.0	inactivity,quiet	meditating

continued

5020	3.0	home activities	garage),vigorous effort
5021	3.5	home activities	mopping
5025	2.5	home activities	multiple household tasks all at once,light effort
5026	3.5	home activities	multiple household tasks all at once,moderate effort
5027	4.0	home activities	multiple household taskes all at once,vigorous effort
5030	3.0	home activities	cleaning,house or cabin,general
5040	2.5	home activities	cleaning,light(dusting,straightening up,changing linen,carrying out trash)
5041	2.3	home activities	wash dishes - standing or in general(not broken into stand/walk components)
5042	2.5	home activities	wash dishes;clearing dishes from table - walking
5043	3.5	home activities	vacuuming
5045	6.0	home activities	butchering animals
5050	2.0	home activities	cooking or food preparation - standing or sitting or in general(not broken into stand/walk components),manual appliances
5051	2.5	home activities	serving food,setting table - implied walking or standing
5052	2.5	home activities	cooking or food preparation - walking

continued

5053	2.5	home activities	feeding animals
5055	2.5	home activities	putting away groceries(e.g. carrying groceries,shopping without a grocery cart),carrying packages
5056	7.5	home activities	carrying groceries upstairs
5057	3.0	home activities	cooking Indian bread on an outside stove
5060	2.3	home activities	food shopping with or without a grocery cart,standing or walking
5065	2.3	home activities	non-food shopping,standing or walking
5070	2.3	home activities	ironing
5080	1.5	home activities	sitting - knitting,sewing,lt.wrapping(presents)
5090	2.0	home activities	implied standing - laundry,fold or hang clothes,put clothes in washer or dryer,packing suitcase
5095	2.3	home activities	implied walking - putting away clothes to pack,putting away laundry
5100	2.0	home activities	making bed

continued

5146	3.5	home activities	standing - packing/unpacking boxes,occasional lifting of household items light - moderate effort
5147	3.0	home activities	implied walking - putting away household items - moderate effort
5148	2.5	home activities	watering plants
5149	2.5	home activities	building a fire inside
5150	9.0	home activities	moving household items upstairs,carrying boxes or furniture
5160	2.0	home activities	standing - light(pump gas,change light bulb,etc.)
5165	3.0	home activities	walking - light,non-cleaning(readying to leave,shut/lock doors, close windows,etc.)
5170	2.5	home activities	sitting - playing with child(ren) - light,only active periods
5171	2.8	home activities	standing - playing with child(ren) - light,only active periods
5175	4.0	home activities	walk/run - playing with child(ren) - moderate,only active periods
5180	5.0	home activities	walk/run - playing with child(ren) - vigorous,only active periods

continued

5138	1.5	home activities	reclining with baby
5130	2.5	home activities	sit,playing with animals,light,only active periods
5131	2.8	home activities	stand,playing with animals,light,only active periods
5132	2.8	home activities	walk/run,playing with animals,light,only active periods
5133	4.0	home activities	walk/run,playing with animals,moderate,only active periods
5134	5.0	home activities	walk/run,playing with animals,vigorous,only active periods
5135	3.5	home activities	standing - bathing dog
6010	3.0	home repair	airplane repair
6020	4.0	home repair	automobile body work

continue

6090	4.5	home repair	caulking,except log cabin
6100	5.0	home repair	cleaning gutters
6110	5.0	home repair	excavating garage
6120	5.0	home repair	hanging storm windows
6130	4.5	home repair	laying or removing carpet
6140	4.5	home repair	laying tile or linoleum,repairing appliances
6150	5.0	home repair	painting,outside home(Taylor Code 650)
6160	3.0	home repair	painting,papering,plastering,scraping,inside house,hanging sh rock,remodelling
6165	4.5	home repair	painting,(Taylor Code 630)
6170	3.0	home repair	put on and removal of tarp - sailboat

TOSHIBA
Leading Innovation >>>

ICF: International Classification of Functioning, Disability and Health by WHO

- **body functions**
- **body structures**
- **impairments**
- **activity**
- **participation**
- **activity limitations**
- **participation restrictions**
- **environmental factors**

ICF first level (1/2)

- **body functions**
  1. **mental functions**
  2. **sensory functions and pain**
  3. **voice and speech functions**
  4. **functions of the cardiovascular, hematological, immunological and respiratory systems**
  5. **functions of the digestive, metabolic and endocrine systems**
  6. **genitourinary and reproductive functions**
  7. **neuromusculoskeletal and movement-related functions**
  8. **functions of the skin and related structures**
- **body structures**
  1. **structures of the nervous system**
  2. **the eye, ear and related structures**
  3. **structures involved invoice and speech**
  4. **structures of the cardiovascular, immunological and respiratory systems**
  5. **structures related to the digestive, metabolic and endocrine systems**
  6. **structures related to the genitourinary and reproductive systems**
  7. **structures related to movement**
  8. **skin and related structures**

ICF first level (2/2)

- **activities and participation**
  1. **learning and applying knowledge**
  2. **general tasks and demands**
  3. **communication**
  4. **mobility**
  5. **self-care**
  6. **domestic life**
  7. **interpersonal interactions and relationships**
  8. **major life area**
  9. **community, social and civic life**

- **environmental factors**
  1. **products and technology**
  2. **natural environment and human-made changes to environment**
  3. **support and relationships**
  4. **Attitudes**
  5. **services, systems and policies**

Activities and participation (1/5)

1. learning and applying knowledge

purposeful sensory experiences（d110-d129）
- d110 watching
- d115 listening
- d120 other purposeful sensing
- d129 purposeful sensory experiences, other specified and unspecified

basic learning（d130-d159）
- d130 copying
- d135 rehearsing
- d140 learning to read
- d145 learning to write
- d150 learning to calculate
- d155 acquiring skills
- d159 basic learning, other specified and unspecified

applying knowledge（d160-d179）
- d160 focusing attention
- d163 thinking
- d166 reading
- d170 writing
- d172 calculating
- d175 solving problems
- d177 making decisions
- d179 applying knowledge, other specified and unspecified
- d198 learning and applying knowledge, other specified
- d199 learning and applying knowledge, unspecified

2. general tasks and demands

- d210 undertaking a single task
- d220 undertaking multiple tasks
- d230 carrying out daily routine
- d240 handling stress and other psychological demands
- d298 general tasks and demands, other specified
- d299 general tasks and demands, unspecified

Activities and participation (2/5)

3. communication

communicating-receiving（d310-d329）
- d310 communicating with-receiving-spoken messages
- d315 communicating with-receiving-nonverbal messages
- d320 communicating with-receiving-formal sign language messages
- d325 communicating with-receiving-written messages
- d329 communicating-receiving, other specified and unspecified

communicating-producing（d330-d349）
- d330 speaking
- d335 producing nonverbal messages
- d340 producing messages in formal sign language
- d345 writing messages
- d349 communication-producing, other specified and unspecified

conversation and use of communication devices and techniques（d350-d369）
- d350 conversation
- d355 discussion
- d360 using communication devices and techniques
- d369 conversation and use of communication devices and techniques, other specified and unspecified
- d398 communication, other specified
- d399 communication, unspecified

Activities and participation (3/5)

4. mobility

changing and maintaining body position（d410-d429）
- d410 basic body position
- d415 maintaining a body position
- d420 transferring oneself
- d429 changing and maintaining body position, other specified and unspecified

carrying, moving and handling objects（d430-d449）
- d430 lifting and carrying objects
- d435 moving objects with lower extremities
- d440 fine hand use
- d445 hand and arm use
- d449 carrying, moving and handling objects, other specified and unspecified

walking and moving（d450-d469）
- d450 walking
- d455 moving around
- d460 moving around in different locations
- d465 moving around using equipment
- d469 walking and moving, other specified and unspecified

moving around using transportation（d470-d489）
- d470 using transportation
- d475 driving
- d480 riding animals for transportation
- d489 moving around using transportation, other specified and unspecified
- d498 mobility, other specified
- d499 mobility, unspecified

Activities and participation (4/5)

5. self-care

- d510 washing oneself
- d520 caring for body parts
- d530 toileting
- d540 dressing
- d550 eating
- d560 drinking
- d570 looking after one's health
- d598 self-care, other specified
- d599 self-care, unspecified

6. domestic life

acquisition of necessities（d610-d629）
- d610 acquiring a place to live
- d620 acquisition of goods and services
- d629 acquisition of necessities, other specified and unspecified

household tasks（d630-d649）
- d630 preparing meals
- d640 doing housework
- d649 household tasks, other specified and unspecified

caring for household objects and assisting others（d650-d669）
- d650 caring for household objects
- d660 assisting others
- d669 caring for household objects and assisting others, other specified and unspecified
- d698 domestic life, other specified
- d699 domestic life, unspecified

Activities and participation (5/5)

7. interpersonal interactions and relationships

general interpersonal interactions（d710-d729）
- d710 basic interpersonal interactions
- d720 complex interpersonal interactions
- d729 general interpersonal interactions, other specified and unspecified

particular interpersonal relationships（d730-d779）
- d730 relating with strangers
- d740 formal relationships
- d750 informal social relationships
- d760

family relationships
- d770 intimate relationships
- d779 particular interpersonal relationships, other specified and unspecified
- d798 interpersonal interactions and relationships, other specified
- d799 interpersonal interactions and relationships, unspecified

8. major life areas

education（d810-d839）
- d810 informal education
- d815 preschool education
- d820 school education
- d825 vocational training
- d830 higher education
- d839 education, other specified and unspecified work and employment （d840-d859）
- d840 apprenticeship (work preparation)
- d845 acquiring, keeping and terminating a job
- d850 remunerative employment
- d855 non-remunerative employment
- d859 work and employment, other specified and unspecified

economic life（d860-d879）
- d860 basic economic transactions
- d865 complex economic transactions
- d870 economic self-sufficiency
- d879 economic life, other specified and unspecified
- d898 major life areas, other specified
- d899 major life areas, unspecified

9. community, social and civic life
- d910 community life
- d920 recreation and leisure
- d930 religion and spirituality
- d940 human rights
- d950 political life and citizenship
- d998 community, social and civic life, other specified
- d999 ommunity, social and civic life, unspecified

Activities of Daily Living (ADL): Barthel Index

- **FEEDING**
  - 0 = unable
  - 5 = needs help cutting, spreading butter, etc., or requires modified diet
  - 10 = independent
- **BATHING**
  - 0 = dependent
  - 5 = independent (or in shower)
- **GROOMING**
  - 0 = needs to help with personal care
  - 5 = independent face/hair/teeth/shaving (implements provided)
- **DRESSING**
  - 0 = dependent
  - 5 = needs help but can do about half unaided
  - 10 = independent (including buttons, zips, laces, etc.)

Barthel index (continued)

- **BOWELS**
  - 0 = incontinent (or needs to be given enemas)
  - 5 = occasional accident
  - 10 = continent
- **BLADDER**
  - 0 = incontinent, or catheterized and unable to manage alone
  - 5 = occasional accident
  - 10 = continent
- **TOILET USE**
  - 0 = dependent
  - 5 = needs some help, but can do something alone
  - 10 = independent (on and off, dressing, wiping)

Barthel index (continued)

- **TRANSFERS (BED TO CHAIR AND BACK)**
  - 0 = unable, no sitting balance
  - 5 = major help (one or two people, physical), can sit
  - 10 = minor help (verbal or physical)
  - 15 = independent
- **MOBILITY (ON LEVEL SURFACES)**
  - 0 = immobile or < 50 yards
  - 5 = wheelchair independent, including corners, > 50 yards
  - 10 = walks with help of one person (verbal or physical) > 50 yards
  - 15 = independent (but may use any aid; for example, stick) > 50 yards
- **STAIRS**
  - 0 = unable
  - 5 = needs help (verbal, physical, carrying aid)
  - 10 = independent

INSTRUMENTAL ACTIVITIES OF DAILY LIVING SCALE (IADL)
M.P. Lawton & E.M. Brody

- **A. Ability to use telephone**
  1. Operates telephone on own initiative;
     looks up and dials numbers, etc.
  2. Dials a few well-known numbers
  3. Answers telephone but does not dial
  4. Does not use telephone at all.
- **B. Shopping**
  1. Takes care of all shopping needs independently
  2. Shops independently for small purchases
  3. Needs to be accompanied on any shopping trip.
  4. Completely unable to shop.

INSTRUMENTAL ACTIVITIES OF DAILY LIVING SCALE (IADL)
M.P. Lawton & E.M. Brody (continued)

- **C. Food Preparation**
  1. Plans, prepares and serves adequate meals Independently
  2. Prepares adequate meals if supplied with ingredients
  3. Heats, serves and prepares meals or prepares
     meals but does not maintain adequate diet.
  4. Needs to have meals prepared and served.
- **D. Housekeeping**
  1. Maintains house alone or with occasional assistance (e.g. “heavy work domestic help”)
  2. Performs light daily tasks such as dishwashing, bed making
  3. Performs light daily tasks but cannot maintain acceptable level of cleanliness.
  4. Needs help with all home maintenance tasks.
  5. Does not participate in any housekeeping tasks.

INSTRUMENTAL ACTIVITIES OF DAILY LIVING SCALE (IADL)
M.P. Lawton & E.M. Brody (continued)

- **E. Laundry**
  1. Does personal laundry completely
  2. Launders small items; rinses stockings, etc.
  3. All laundry must be done by others.
- **F. Mode of Transportation**
  1. Travels independently on public transportation or drives own car.
  2. Arranges own travel via taxi, but does not otherwise use public transportation.
  3. Travels on public transportation when accompanied by another.
  4. Travel limited to taxi or automobile with assistance of another.
  5. Does not travel at all.

INSTRUMENTAL ACTIVITIES OF DAILY LIVING SCALE (IADL)
M.P. Lawton & E.M. Brody (continued)

- **G. Responsibility for own medications**
  1. Is responsible for taking medication in correct dosages at correct time.
  2. Takes responsibility if medication is prepared in advance in separate dosage.
  3. Is not capable of dispensing own medication.
- **H. Ability to Handle Finances**
  1. Manages financial matters independently (budgets, writes checks, pays rent, bills goes to bank), collects and keeps track of income.
  2. Manages day-to-day purchases, but needs help with banking, major purchases, etc.
  3. Incapable if handling money

Features of behavioral states for Robots

- **Diverse receivers**
  - Doctor
  - Nurse
  - Helper
  - Family
  - Other robot, agent, and so on.
- **Sequential behavioral states**
  - Not single behavioral state

Behaviors states by Mitsubishi Heavy Industry

Behaviors	Principle actions				
	location	pass	attitude	hand position	face direction
Module1: 5 behaviors ・Still ・Walk slowly ・Walk ・Stop ・Start	—	stillness low speed high speed move and stop stop and move	—	—	—
Module2: 7 behaviors ・Go back and forth ・Move forth or back ・come lose or become remote ・walk zigzag ・come back	wide area plural areas wide area area	Move long distance into area into area oscillate go out and back	—	—	—

Behaviors states by MHI (continued)

Behaviors	Principle actions				
	location	pass	attitude	hand position	face direction
Module3: 13 behaviors ・Into, out, stay in area ・Stay in area over a certain period ・Look at a direction board ・Stay at a direction board long time ・Wait and see at the front of a shop ・Stay at a vendor machine long time ・Stay at a showpiece long time	within area within area in front of a direction board Id. in front of a shop in front of a vendor machine In front of a showpiece	move still over a certain period Id. Id. Id. still or move long time Id.		—	— — to a direction board arbitrary to a shop to a vendor machine downward

Behaviors states by MHI (continued)

Behaviors	Principle actions				
	location	Pass	attitude	hand position	face direction
・Roam in front of showpieces ・Look at TV ・Wait in a sitting position ・Be in sitting on the floor in front of a shop	In front of showpieces In front of TV In a waiting room In front of a shop	back-and-forth still Still still long time	sitting on a chair sitting on a floor	—	downward to TV —
Module 4: 6 behaviors ・Be in standing ・Be in sitting on a chair ・Be in sitting on the floor ・Sit on a chair ・Sit on the floor ・Stand up	—	still	standing sitting on a chair sitting on the floor stand and sit on stand and sit on sit on and stand	—	—

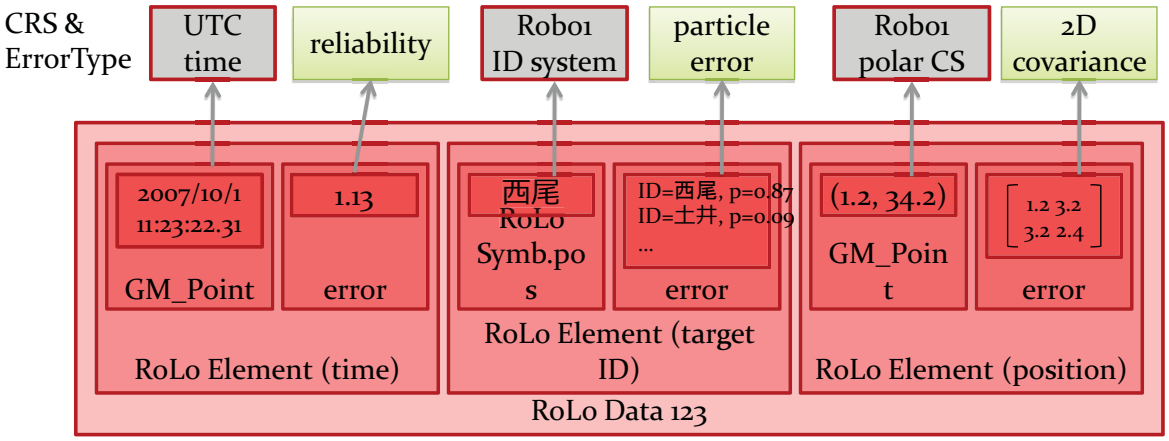
Behaviors states by MHI (continued)

Behaviors	Principle actions				
	location	Pass	attitude	hand position	face direction
Module 5 : 15 behaviors ・Both hands (up, side , down) ・Both hands (upward, downward) ・Right hand (up, side , down) ・ Left hand (up, side , down) ・Right hand (upward, downward) ・ Left hand (upward, downward)	—	still	—	position of both hands change of both hands position position of right hand position ofl eft hand change of right hand position change of right hand positon	front

Behaviors states by MHI (continued)

Behaviors	Principle actions				
	location	Pass	attitude	hand position	face direction
Module 6 : 4 behaviors ・Eating ・Drinking ・Reading ・ Writing	—	still	sitting	hand motion according to each behaviors (time series data of position changing)	—

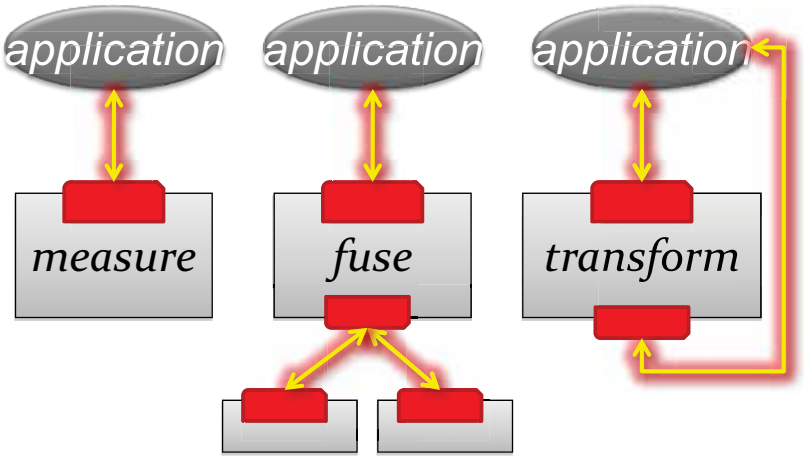
RoLo Architecture



Treat various types of location-related information in *a uniform manner*

Cited from
http://www.dpc.jipdec.or.jp/gxml/contents/shiryou/2008/jiku_yokousyuu/05_Nishio.pdf

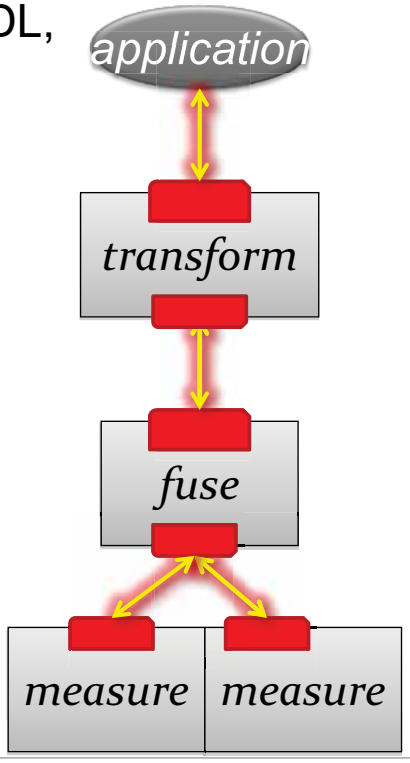
uniform architecture



Homogeneous n-input, 1-output interface
- *High reusability*
- *Allow recursive or cascading connection*

Behavior states transformed using RoLo

ICF, ADL, IADL, and so on.



Issues

- **RoLo corresponds to transform diverse behavioral states**
- **RoLo will be advanced corresponding to sequential behavioral states**

New Item

- **Sequential Behavioral States Accumulation and Analysis**
  - Evaluate RoLo architecture to tranform behavioral states
  - Advance RoLo architecture to handle sequential behavioral states

TOSHIBA
Leading Innovation

This research was supported by Ministry of Internal Affairs and Communications

Robotics Domain Task Force
Steering Committee Meeting

8th December, 2009

Long Beach, CA, USA

Hyatt Regency Long Beach

San Antonio Meeting Summary

Robotics Plenary: (15 participants)

- **2 New Work Item Discussion**
  - **RTC Deployment and Dynamic Reconfiguration RFP**
  - **User Identification Service RFP**
- **2 WG Reports** [robotics/2009-09-12, -15]
- **1 Contact Reports** [robotics/2009-09-17]
- **Preliminary agenda for upcoming meeting** [robotics/2009-09-19]

Agenda Review

Mon(Dec. 7th):

Discussion Meeting

Tue(Dec. 8th):

Steering Committee

WG activities: Service WG, Infrastructure WG

Wed(Dec. 9th):

WG activities(AM): Service WG

Robotics-DTF Plenary (PM)

Joint Plenary with MARS (16:00-17:00)

Thu(Dec. 10th):

WG activities: Service WG?

please check our up-to-date agenda
http://staff.aist.go.jp/t.kotoku/omg/RoboticsAgenda.pdf

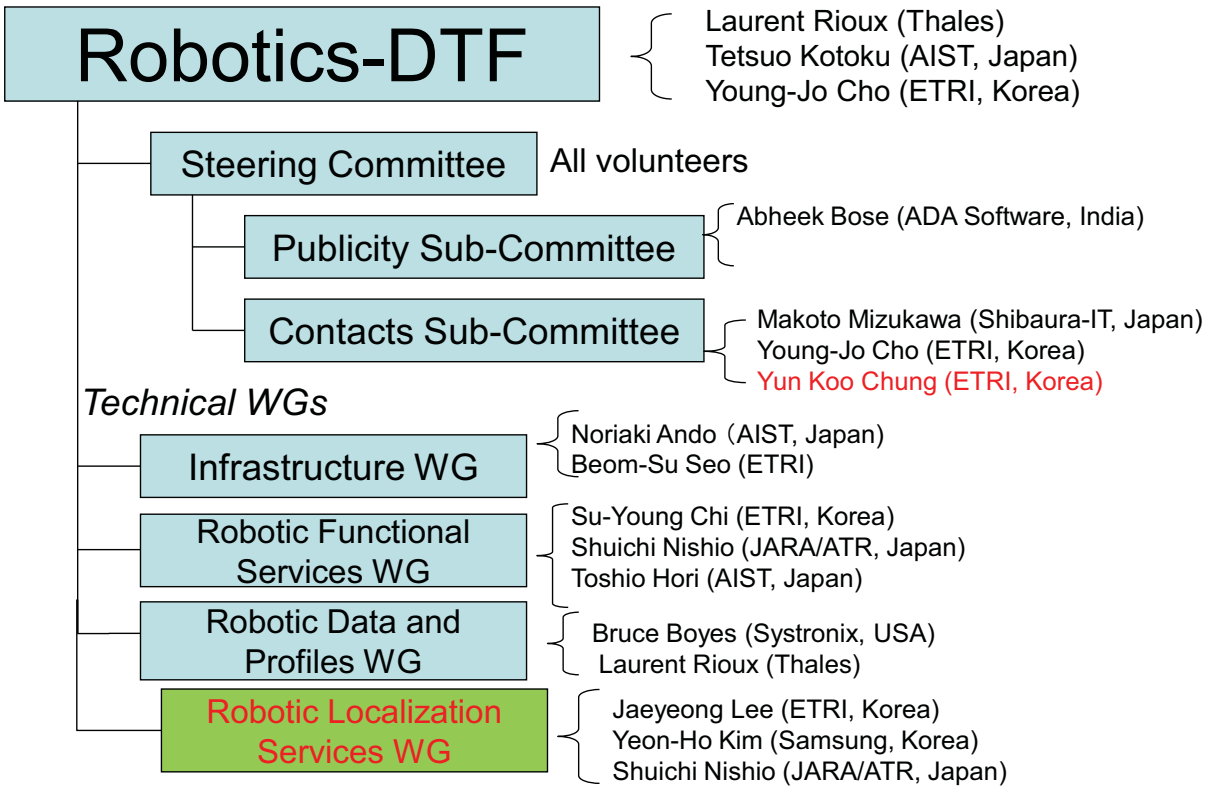
Minutes and Minutes Taker

- Process:
  - Make a draft with in 5days
  - Send the initial draft to robotics-chairs@omg.org
  - Post the draft to the OMG server within a week
  - Make an announcement to robotics@omg.org
  - Send comments to robotics@omg.org
  - Approve the revised minutes at the Next meeting

- Volunteers for this Meeting
  - Geoffrey Biggs
  - Rockwon Kim

We have to post our meeting minutes within a week!

Organization



Roadmap for Robotics Activities

robotics/2009-12-05

Item	Status	San Antonio, TX Sep-2009	Long Beach, CA Dec-2009	Jacksonville FL Mar-2010	Minneapolis MN Jun-2010	Cambridge MA Sep-2010	Santa Clara CA Dec-2010	POC / Comment
Flyer of Robotics-DTF [Publicity Sub-Committee]	Suspended							Abheek(ADA Software)
User Identification Service RFP [Robotic Functional Services WG]	In Process		discussion	1st review RFP	2nd Review & RFP issue		Initial Submittion	Su-Young Chi (ETRI)
RTC deployment and dynamic reconfiguration RFP(tentative) [Robotic Infrastructure WG]	In Process	discussion	1st review RFP	2nd Review & RFP issue		Initial Submittion		
UML profile for Archtecture Framework for Robotics/Unmanned Systems [Robotic Data and Profiles WG]	Planned							
The QoS and Fault-tolerance Issues on the Robot Component Execution Enviornment [Robotic Infrastructure WG]	Planned							
Robotic Map Services RFP [Robotic Functional Services WG	Planned							
Hardware-level Resources: define resource profiles RFP [Profile WG]	Future							
etc…	Future							
Robotics Information Day [Technology Showcase]	Future							
RLS Revision Task Force	In Process		Charter					

Related Events

High-Level Task Description For Robots

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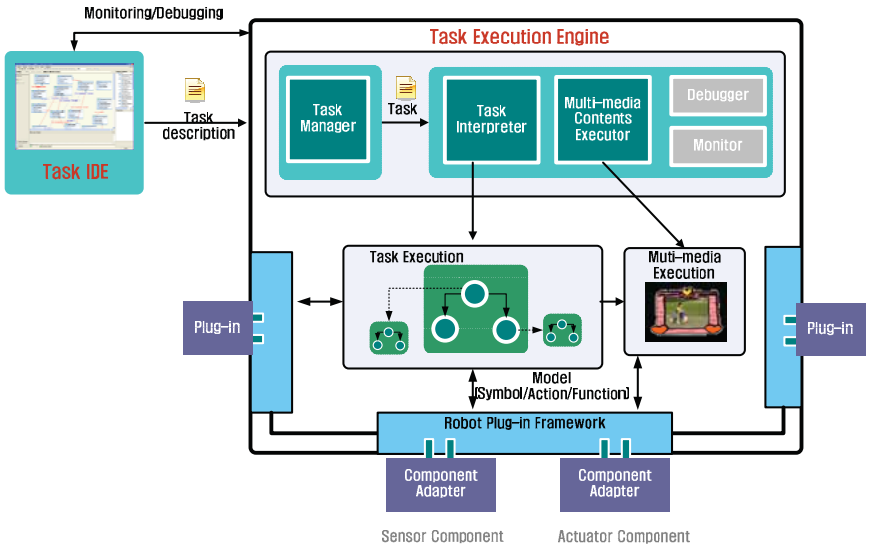
ETRI

Contents

- Motivation & Background
- Introduction
- Constructs
- A simple example
- World Model Binding
- Conclusion

Project Plan for OPRoS : Robot Task Part

1st year (2008)	2nd year (2009)	3rd year (2010)
▪ Development of the task interpreter ▪ Development of Plug-in framework for robots ▪ Development of IDE to describe robot tasks	▪ Support of concurrent execution of robot tasks ▪ Monitoring the task execution in a robot	▪ Support of debugging the execution of robot tasks ▪ Combining with external program(Video, App and etc.)



I. Motivation

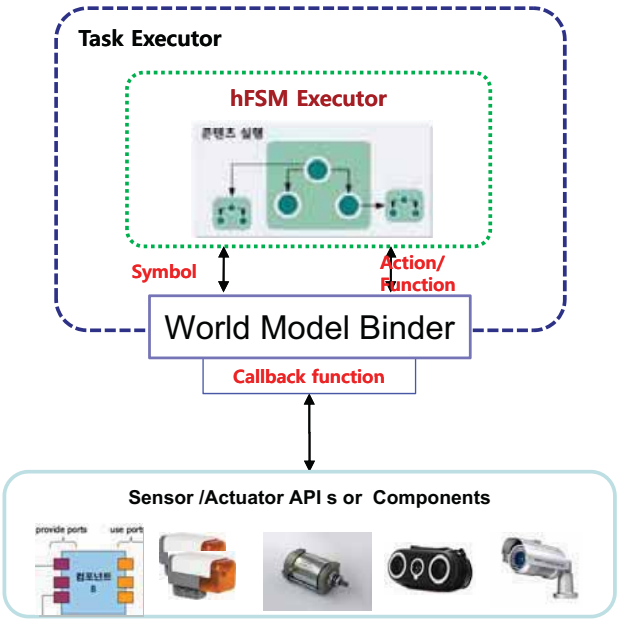
- Contemporary robot applications extends to many fields of service
  - Services robots cooperate with people for achieving a particular goal
  - These robots commonly face unpredictable situations and problems while performing their tasks
  - Therefore, we need a high-level task description method to change or update the task for the users of robots easily




	Service Robots	Industrial robots
Tasks	Re-programmable	Pre-programmed repetitive
Users	Ordinary people	Skilled people
Working env.	Cluttered	Structured
Service type	Direct	Indirect

II. Background

Layers of the Robot Application



Application(Task)

Tasks are applications that are defined by users who do not know exaction device APIs or algorithms.
Eg) if a ball is detected approach to that.

Application dependent/support (Binding Library)

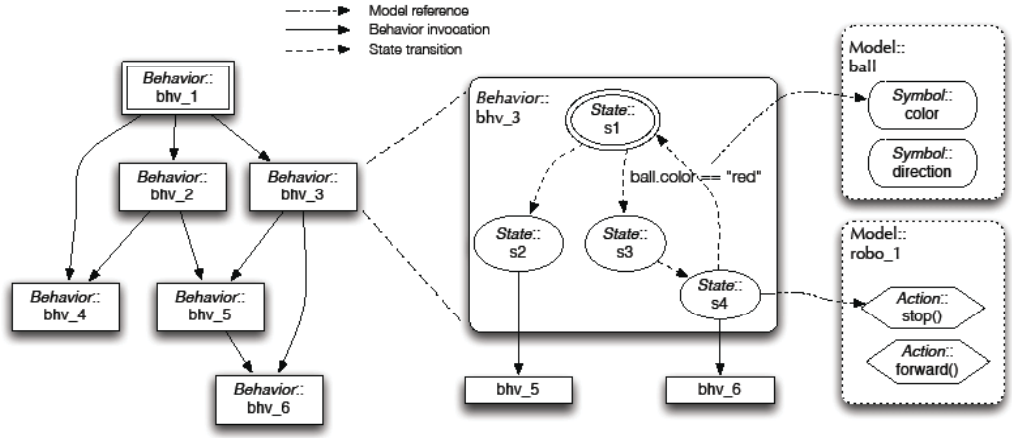
Symbols or functions that support applications
Ee) ball detection

Application independent (device API, Component)

APIs or libraries that are dependent on hardware devices.
Reusable common libraries.
Eg) Mobility, PSD value, image data, detection/recognition algorithms

I. Overview

Structure of Task Description Model



(a) An example of the hierarchy of behaviors

(b) The internal state machine of a behavior

II. Constructs

World Model

- *A model* is the group of a logical view of sensors and actuators used in tasks.
- There are three kinds of element in a *model* : symbol, function, action, and variable.
  - *Symbol*
    - represents raw-sensor data or the manipulated value of them
  - *Function*
    - provides the result of calculation of several symbols and/or sensor data for given parameters.
  - *Action*
    - represents an actuating function in a robot
  - *Variable*
    - is globally used through whole behaviors of a task

Behavior

- A *behavior* is defined as FSM
- A *behavior* can invoke other *behaviors*
- Invocation of sub-*behaviors* makes the hierarchy of *behaviors*
- The hierarchy of *behaviors* is a directed acyclic graph

Task

- A *task* is a rooted directed acyclic graph
- The root *behavior* of a *task* is the start *behavior* of a *task*
- *Task* execution is iterations of action selection
- Action selection is a sequence of *behavior*, *state* and *action-block(entry, stay, exit)*

II. Constructs : World Model

```
model m1{
  //Symbol definition
  in      int ele1;
  out     int ele2;

  //Action definition
  action  void  tts(string msg);

  //variable definition
  gvar    int ele3;
  tvar    int ele4;

  //function definition
  string  func1(int arg1);
}
```

modifier	description
in	Read only symbol
out	Write only symbol
gvar	Global variable that is shared among running tasks
tvar	Task variable that could be accessed from everywhere in a running task.
action	A function that manipulates actuating device(s).

- In high-level task, only primitive types are supported.
  - string, integer, float, double, boolean, long
  - User-defined types and their manipulation make robot tasks complicated
  - Complex data is manipulated in binding classes for Models

II. Constructs : Behavior

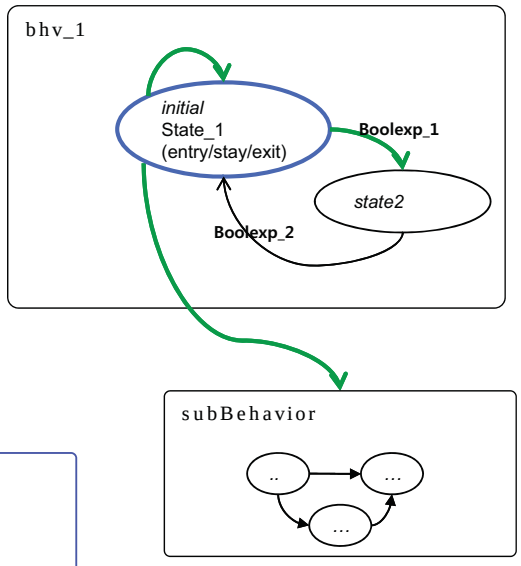
```
Behavior bhv_1(float arg1, float  arg2){

  initial state state_1{
    entry{
      //entry action block is executed once when this state activated
      robot.tts("hello");
    }
    transition{
      if (boolexp_1){
        trans state_2  //transition to other state
      }
      else if(boolexp_2){
        invoke subBehavior(); //sub-behavior invocation
      }
      else
        goto stay;
    }

    stay{
      // stay action block is executed while this state is activated
      robot.forword();
    }

    exit{
      //exit action block is executed once when this state is inactivated
      parallel{
        with: robot.stop();
        with: robot.tts("bye");
      }
    }
  }

  state state_2{
    //…
  }
}
```

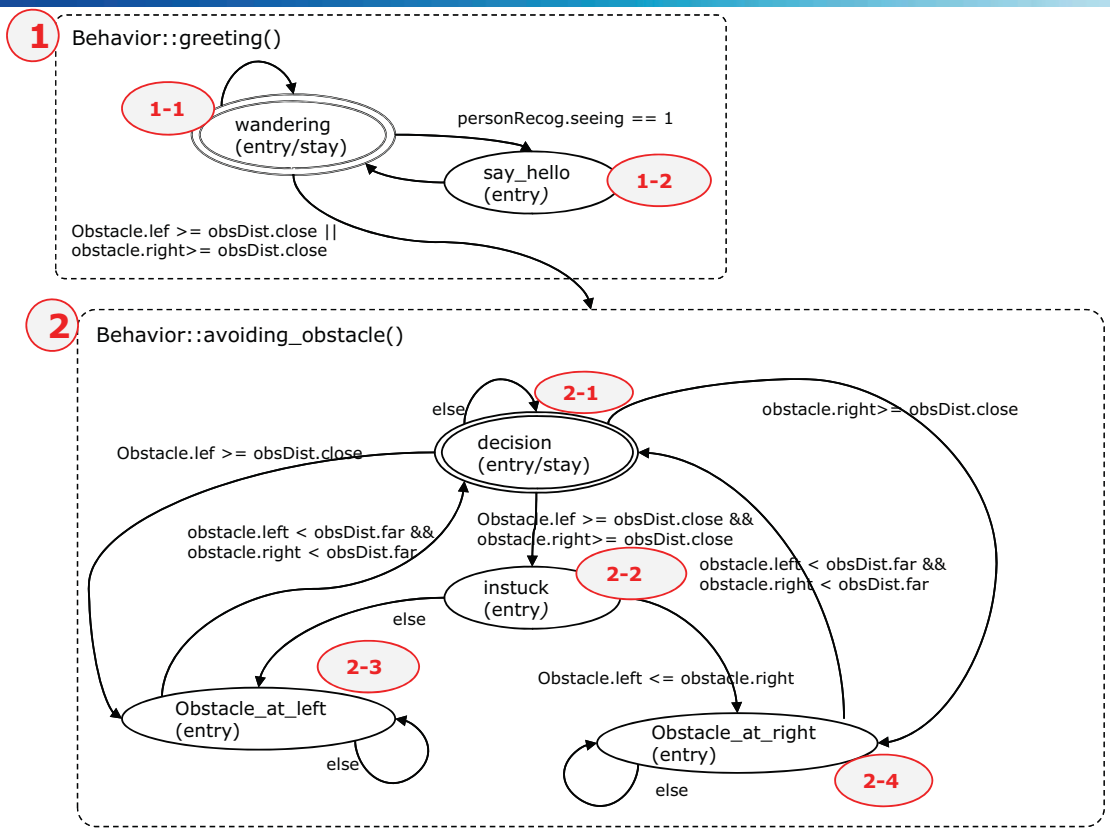


III. A simple example

Task : Helloworld

This task is for a robot to say "hello" if it recognizes a user while wandering around, as well as avoiding obstacles.

III. A simple example



III. A simple example

Definition of World Model

```
enum obsDist{  //distance from obstacle
  none, far, close, bumped
}

model obstacle{
  in int      left;
  in int      right;
}

/* model for recognition of a person */
model personRecog{
  in bool     seeing;       //notification of recognition of a person
  in int      id;           //user id
  in int      location;     //current location
  in float    accuracy;     //accuracy

  string  getPersonName(int id); //function for getting the person's  name
}

 /* model for actuating  the robot*/
model robot{
  action void  turnLeft();
  action void  turnRight();
  action void  forward();
  action void  backward();
  action void  stop();
  action void  tts(string msg);
}
```

III. A simple example

Definition of Behavior::greeting()

1

```
#include "hello_world.model"

behavior greeting(){
```

1-1

```
 initial state wandering{
   entry{
     robot.tts(msg="Welcometo hello world");
   }
   transition{
     if(obstacle.left >= obsDist.close  || obstacle.right >= obsDist.close){
       invoke avoiding_obstacle();
     }
     else if(personRecog.seeing ==true)
       trans say_hello;
     else
       goto stay;
   }
   stay{
     robot.forward();
   }
}
```

1-2

```
state say_hello{
  entry{
    robot.tts(msg="Hello~~");
  }
  transition{
    if(true)
      trans wandering;
  }
}
```


III. A simple example

Behavior:: avoiding_obstacles()

2

```
behavior avoiding_obstacle(){
```

2-1

```
initial state decision{
  entry{
    robot.stop();
  }

  transition{
    if (obstacle.left >= obsDist.close
                && obstacle.right >= obsDist.close)
      trans instuck;
    else if (obstacle.left >= obsDist.close)
      trans obstacle_at_left;
    else if (obstacle.right >= obsDist.close)
      trans obstacle_at_right;
    else
      goto stay;
  }

 stay{
    robot.stop();
  }
}
```

2-2

```
state instuck{
  entry{
     robot.backward();
  }

  transition{
    if (obstacle.left <= obstacle.right)
      trans obstacle_at_right;
    else
      trans obstacle_at_left;
  }
}
```

2-3

```
state obstacle_at_left{
  entry{
    robot.turnRight();
  }

  transition{
    if (obstacle.left < obsDist.far
                    && obstacle.right < obsDist.far)
      trans decision;
    else
      trans obstacle_at_left;
  }
 }
```

2-4

```
state obstacle_at_right{
  entry{
     robot.turnLeft();
  }
  transition{
    if (obstacle.left < obsDist.far &&
       obstacle.right < obsDist.far)
      trans decision;
    else
      trans obstacle_at_right;
  }
 }

}
```

III. A simple example

Task::hello

```
#include "hello_world.behavior"
#include "hello_world.model"

Task hello("This is Hello world task", greeting);
```

Task Name

Root(start) behavior

Conclusion

- The advantages of High-level task description for robots

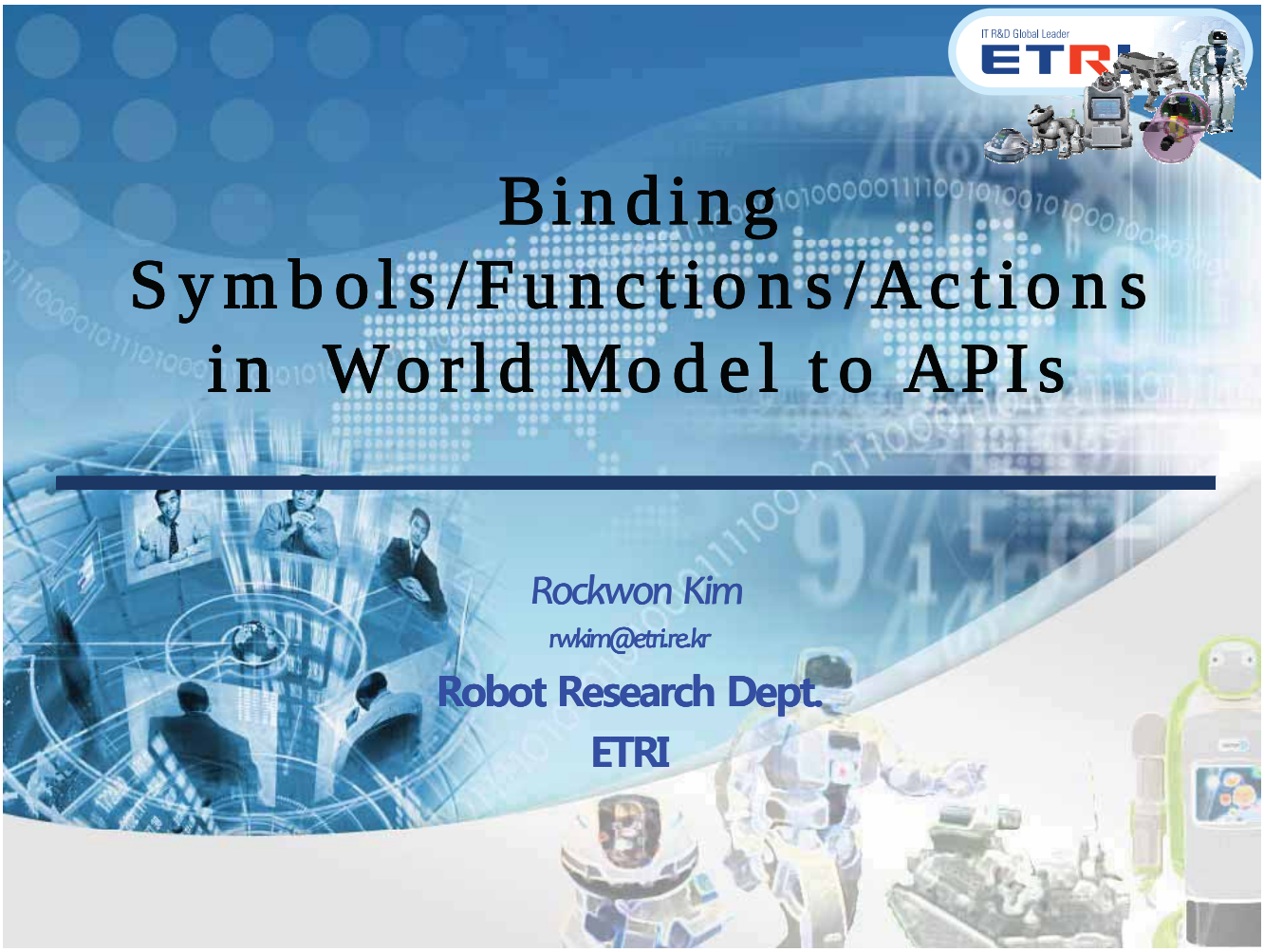
Simplicity

- *h*FSM is a simple formal model
- It has simpler syntax than that of c/c++

Usability

- Task designers do not need to care for primitive APIs for sensors and actuators, because
  - Models can be defined appropriately according to the problems in hand, and
  - dll, so, jar and Plug-ins are responsible for the model and real-world binding
- Task-level task is a kind of interpreter language, so it is helpful for trial and error approach


Thank you



Binding Symbols/Functions/Actions in World Model to APIs

Rockwon Kim
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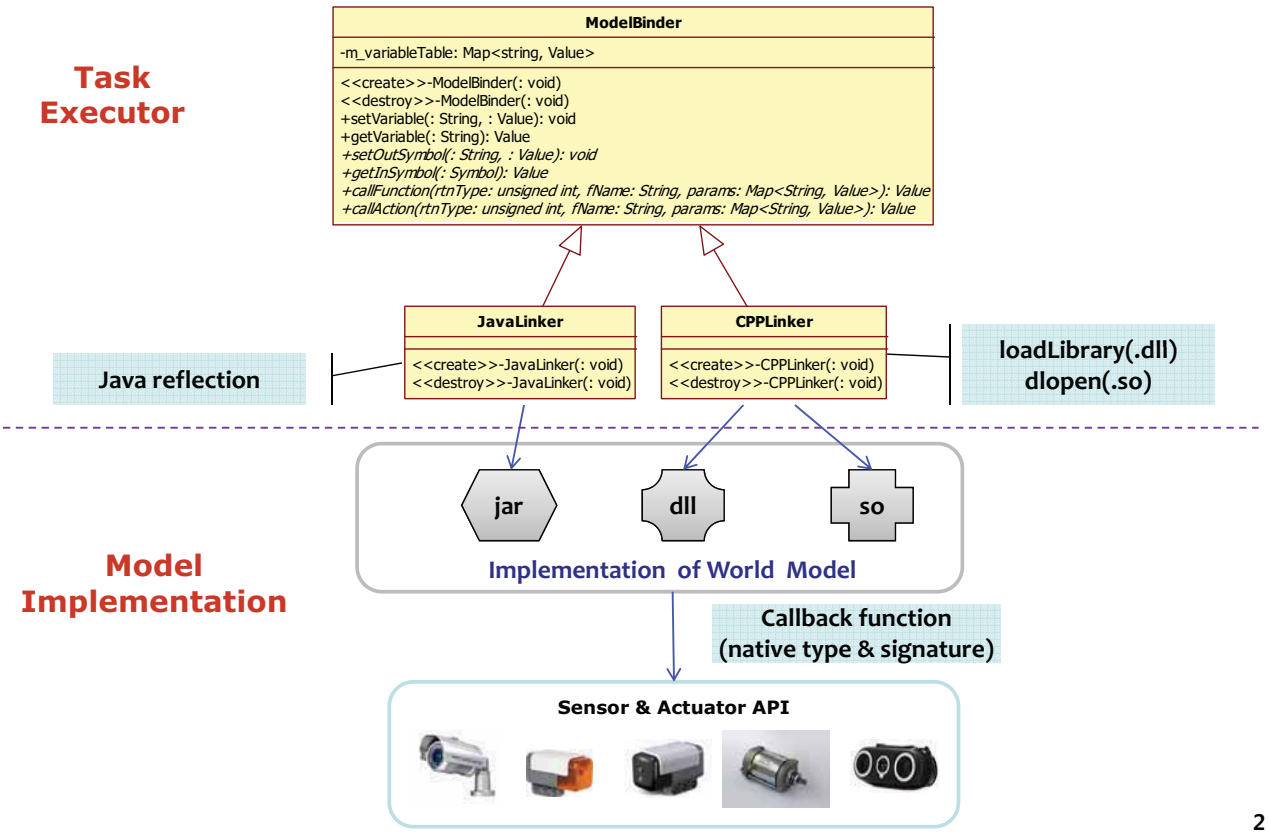
Robot Research Dept.
ETRI

I. Requirements for World Model Binding

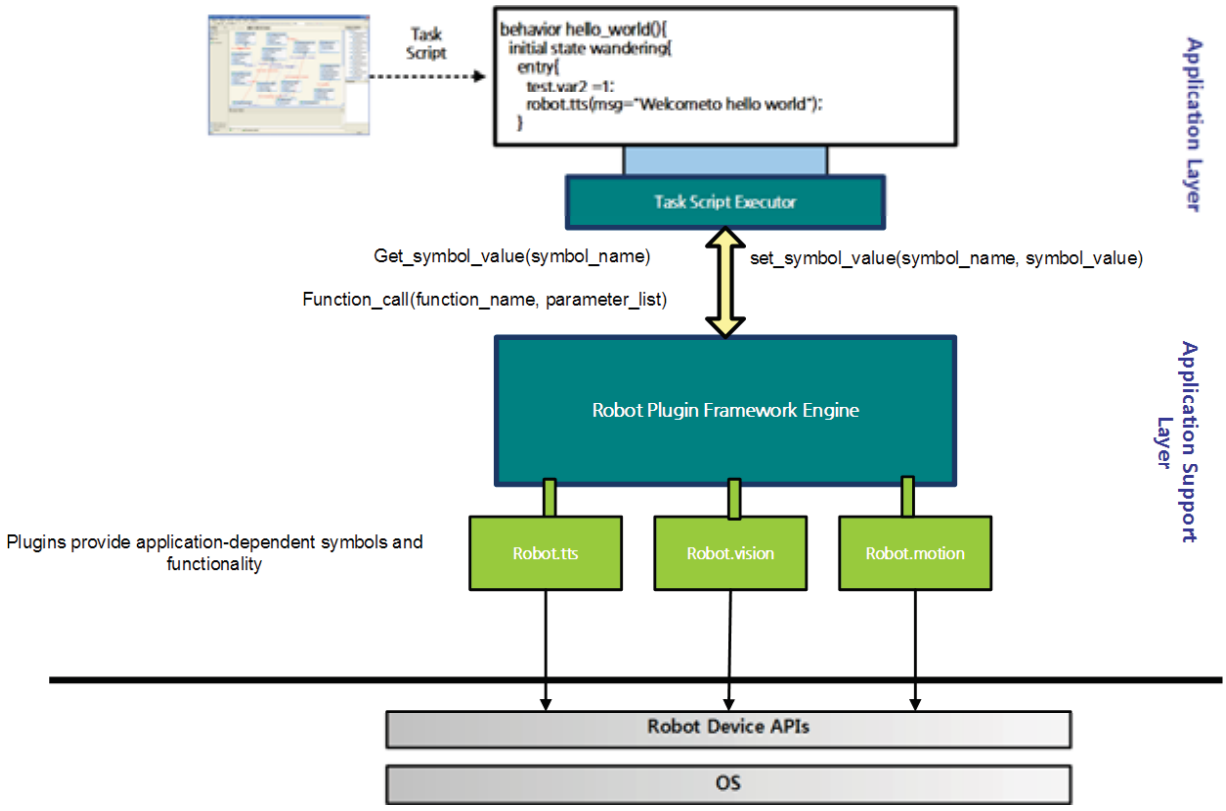
IT R&D Global Leader
ETRI

- The executor for High-Level task have to support dynamic linking(DL) for symbols/functions/actions that is defined in World Model.
- World Model is implemented as
  - c/c++: dll, so
  - Java: natively supports DL
- Model implementation classes have callback functions that use device APIs or other libraries.
- To bind with RTC(?) or OPRoS Component, Task Executor and Model implementation classes should be inherited from them.

II. World Model Binding



III. World Model Binding(using RPF)



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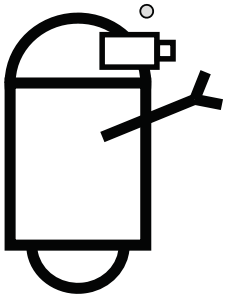


OPRoS Component Tools
= Snapshots =

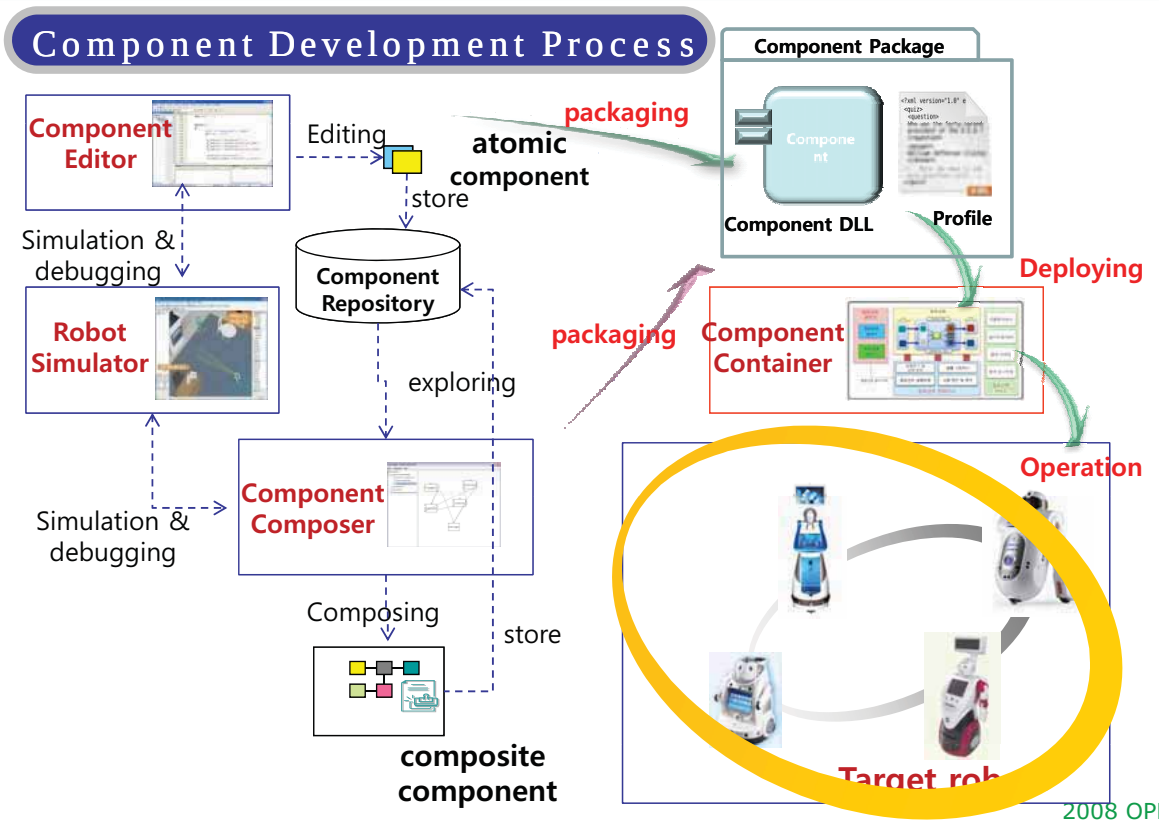
Seung-Woog, Jung
Electronics and Communications Research Institute
Robot Research Department

Contents

- Introduction of OPRoS Component Development
- Component Editor
- Component Composer

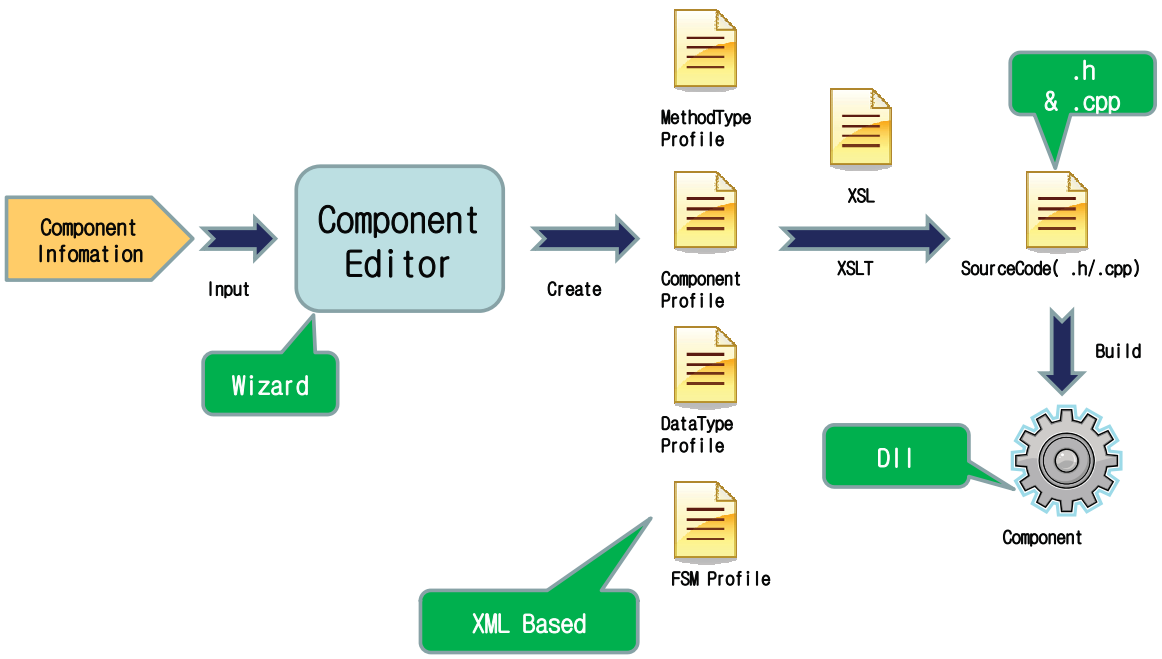
1. Introduction of OPRoS Component

Component Development Process



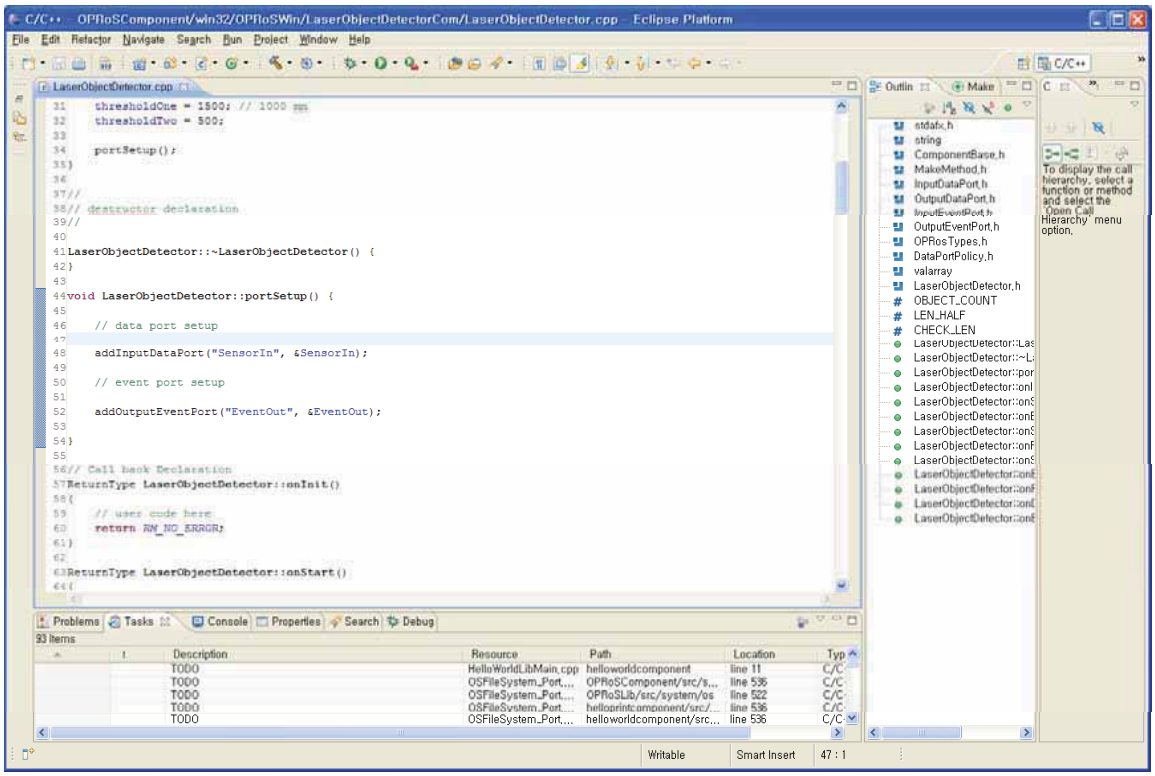
2. Component Editor

Component Development Process



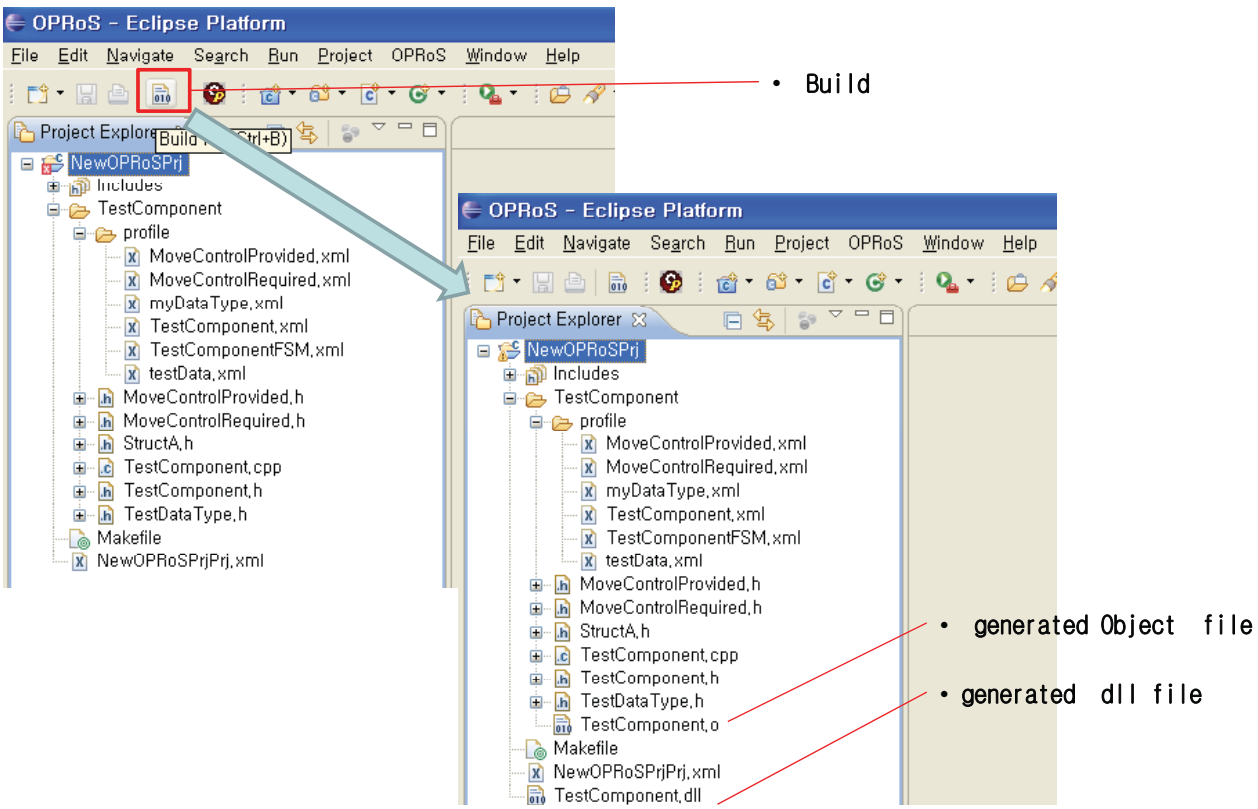
CDT(Component Development Tool)
XSLT (eXtensible Stylesheet Language Transformation)

2. Component Editor



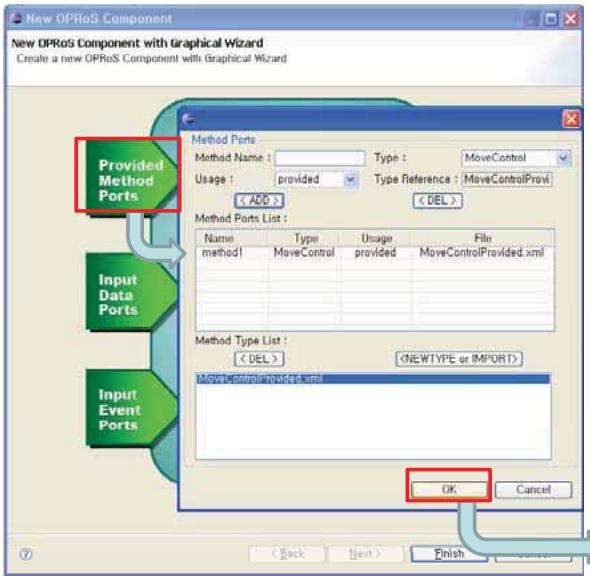
2. Component Editor

- **OPRoS Project Wizard (Build)**

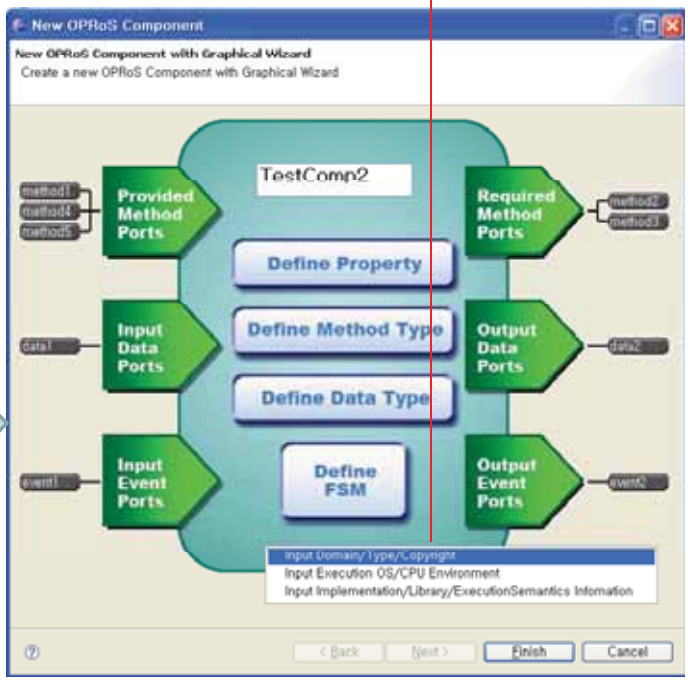


2. Component Editor

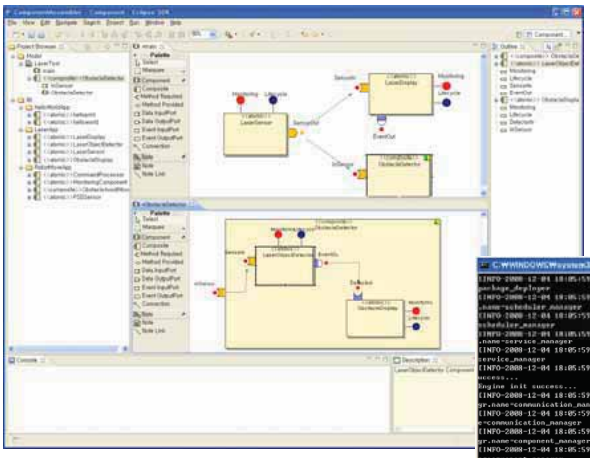
- OPRoS Project Wizard



- Component Information

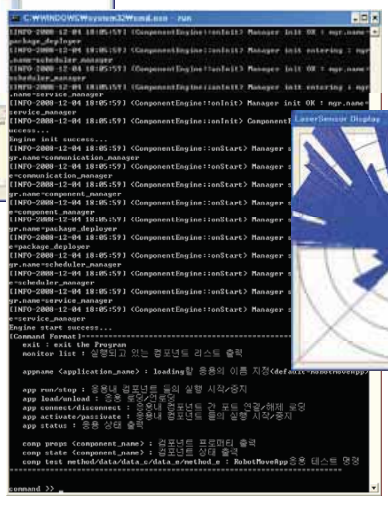


3. Component Composer

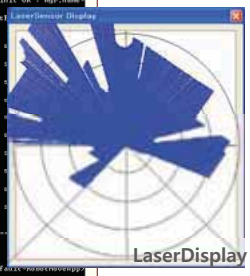


[Component Composing Tool]

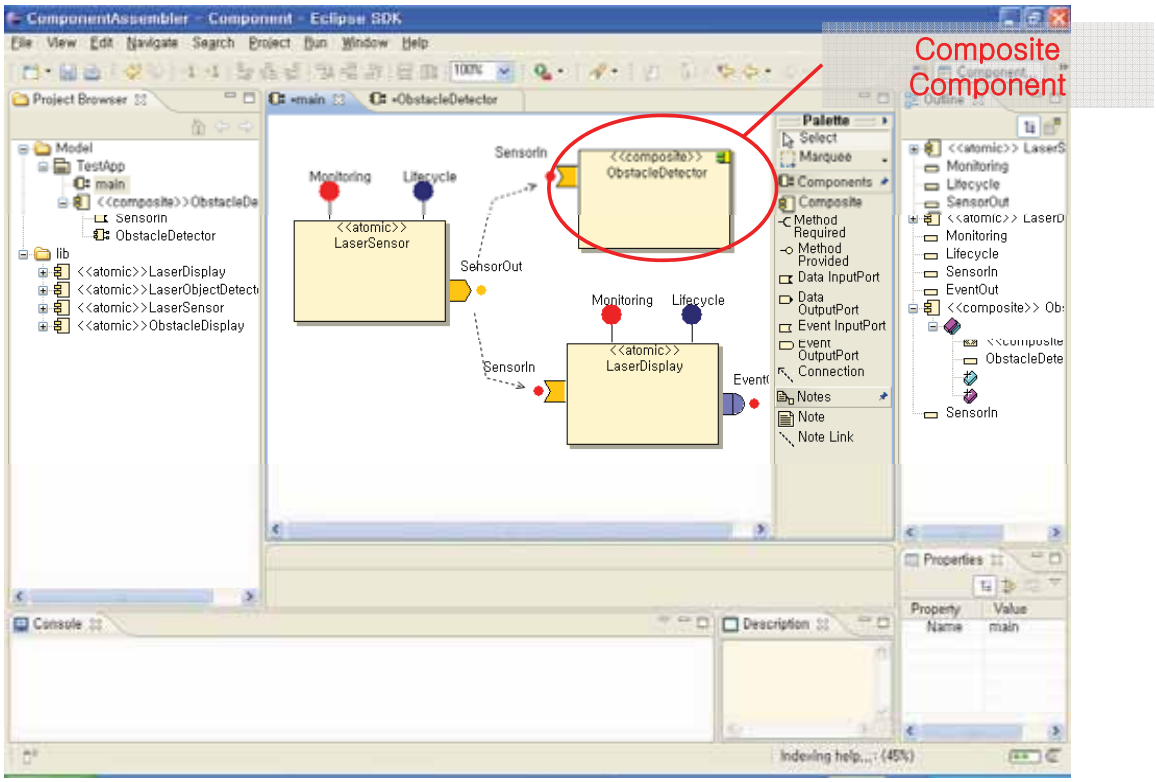
[Component Execution Engine]



[Component Execution]



3. Component Composer



Object Management Group

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Facsimile: +1-781-444-0320

RTC Deployment and Dynamic Reconfiguration (DDR)

Initial Draft Request For Proposal

OMG Document: robotics/2009-~~11-01~~ 12-09

Letters of Intent due: XX June 2010
Submissions due: 23 August 2010

Objective of this RFP

This RFP solicits proposals for the deployment and dynamic reconfiguration of RT components.

In particular, the proposal shall provide:

- Descriptions specific to robotics for the deployment of RT components.
- Interfaces for deploying RT components into robotic systems at runtime.
- Methods and interfaces for notifying the relevant RT component instances of environment changes.
- Methods and interfaces for searching for appropriate RT component instances and dynamically reconfiguring them.

1.0 Introduction

1.1 Goals of OMG

The Object Management Group (OMG) is the world's largest software consortium with an international membership of vendors, developers, and end users. Established in 1989, its mission is to help computer users solve enterprise integration problems by supplying open, vendor-neutral portability, interoperability and reusability specifications based on Model Driven Architecture (MDA). MDA defines an approach to IT system specification that separates the specification of system functionality from the specification of the implementation of that functionality on a specific technology platform, and provides a set of guidelines for structuring specifications expressed as models. OMG has established numerous widely used standards such as OMG IDL[IDL], CORBA[CORBA], Realtime CORBA [CORBA], GIOP/IIOP[CORBA], UML[UML], MOF[MOF], XMI[XMI] and CWM[CWM] to name a few significant ones.

1.2 Organization of this document

The remainder of this document is organized as follows:

Chapter 2 - *Architectural Context* - background information on OMG's Model Driven Architecture.

Chapter 3 - *Adoption Process* - background information on the OMG specification adoption process.

Chapter 4 - *Instructions for Submitters* - explanation of how to make a submission to this RFP.

Chapter 5 - *General Requirements on Proposals* - requirements and evaluation criteria that apply to all proposals submitted to OMG.

Chapter 6 - *Specific Requirements on Proposals* - problem statement, scope of proposals sought, requirements and optional features, issues to be discussed, evaluation criteria, and timetable that apply specifically to this RFP.

Appendix A – *References and Glossary Specific to this RFP*

Appendix B – General References and Glossary

1.3 Conventions

The key words "**must**", "**must not**", "**required**", "**shall**", "**shall not**", "**should**", "**should not**", "**recommended**", "**may**", and "**optional**" in this document are to be interpreted as described in RFC 2119 [RFC2119].

1.4 Contact Information

Questions related to the OMG's technology adoption process may be directed to *omg-process@omg.org*. General questions about this RFP may be sent to *responses@omg.org*.

OMG documents (and information about the OMG in general) can be obtained from the OMG's web site *(http://www.omg.org/)*. OMG documents may also be obtained by contacting OMG at *documents@omg.org*. Templates for RFPs (like this document) and other standard OMG documents can be found at the OMG Template Downloads Page at *http://www.omg.org/technology/template_download.htm*

2.0 Architectural Context

MDA provides a set of guidelines for structuring specifications expressed as models and the mappings between those models. The MDA initiative and the standards that support it allow the same model specifying business system or application functionality and behavior to be realized on multiple platforms. MDA enables different applications to be integrated by explicitly relating their models; this facilitates integration and interoperability and supports system evolution (deployment choices) as platform technologies change. The three primary goals of MDA are portability, interoperability and reusability.

Portability of any subsystem is relative to the subsystems on which it depends. The collection of subsystems that a given subsystem depends upon is often loosely called the *platform,* which supports that subsystem. Portability – and reusability - of such a subsystem is enabled if all the subsystems that it depends upon use standardized interfaces (APIs) and usage patterns.

MDA provides a pattern comprising a portable subsystem that is able to use any one of multiple specific implementations of a platform. This pattern is repeatedly usable in the specification of systems. The five important concepts related to this pattern are:

(1) *Model* – A model is a representation of a part of the function, structure and/or behavior of an application or system. A representation is said to be formal when it is based on a language that has a well-defined form

("syntax"), meaning ("semantics"), and possibly rules of analysis, inference, or proof for its constructs. The syntax may be graphical or textual. The semantics might be defined, more or less formally, in terms of things observed in the world being described (e.g. message sends and replies, object states and state changes, etc.), or by translating higher-level language constructs into other constructs that have a well-defined meaning. The optional rules of inference define what unstated properties you can deduce from the explicit statements in the model. In MDA, a representation that is not formal in this sense is not a model. Thus, a diagram with boxes and lines and arrows that is not supported by a definition of the meaning of a box, and the meaning of a line and of an arrow is not a model—it is just an informal diagram.

(2) *Platform* – A set of subsystems/technologies that provide a coherent set of functionality through interfaces and specified usage patterns that any subsystem that depends on the platform can use without concern for the details of how the functionality provided by the platform is implemented.

(3) *Platform Independent Model (PIM)* – A model of a subsystem that contains no information specific to the platform, or the technology that is used to realize it.

(4) *Platform Specific Model (PSM)* – A model of a subsystem that includes information about the specific technology that is used in the realization of that subsystem on a specific platform, and hence possibly contains elements that are specific to the platform.

(5) *Mapping* – Specification of a mechanism for transforming the elements of a model conforming to a particular metamodel into elements of another model that conforms to another (possibly the same) metamodel. A mapping may be expressed as associations, constraints, rules, templates with parameters that must be assigned during the mapping, or other forms yet to be determined.

For example, in case of CORBA the platform is specified by a set of interfaces and usage patterns that constitute the CORBA Core Specification [CORBA]. The CORBA platform is independent of operating systems and programming languages. The OMG Trading Object Service specification [TOS] (consisting of interface specifications in OMG Interface Definition Language (OMG IDL)) can be considered to be a PIM from the viewpoint of CORBA, because it is independent of operating systems and programming languages. When the IDL to C++ Language Mapping specification is applied to the Trading Service PIM, the C++-specific result can be considered to be a PSM for the Trading Service, where the platform is the C++ language and the C++ ORB implementation.

Thus the IDL to C++ Language Mapping specification [IDLC++] determines the mapping from the Trading Service PIM to the Trading Service PSM.

Note that the Trading Service model expressed in IDL is a PSM relative to the CORBA platform too. This highlights the fact that platform-independence and platform-specificity are relative concepts.

The UML Profile for EDOC specification [EDOC] is another example of the application of various aspects of MDA. It defines a set of modeling constructs that are independent of middleware platforms such as EJB [EJB], CCM [CCM], MQSeries [MQS], etc. A PIM based on the EDOC profile uses the middleware-independent constructs defined by the profile and thus is middleware-independent. In addition, the specification defines formal metamodels for some specific middleware platforms such as EJB, supplementing the already-existing OMG metamodel of CCM (CORBA Component Model). The specification also defines mappings from the EDOC profile to the middleware metamodels. For example, it defines a mapping from the EDOC profile to EJB. The mapping specifications facilitate the transformation of any EDOC-based PIM into a corresponding PSM for any of the specific platforms for which a mapping is specified.

Continuing with this example, one of the PSMs corresponding to the EDOC PIM could be for the CORBA platform. This PSM then potentially constitutes a PIM, corresponding to which there would be implementation language specific PSMs derived via the CORBA language mappings, thus illustrating recursive use of the Platform-PIM-PSM-Mapping pattern.

Note that the EDOC profile can also be considered to be a platform in its own right. Thus, a model expressed via the profile is a PSM relative to the EDOC platform.

An analogous set of concepts apply to Interoperability Protocols wherein there is a PIM of the payload data and a PIM of the interactions that cause the data to find its way from one place to another. These then are realized in specific ways for specific platforms in the corresponding PSMs.

Analogously, in case of databases there could be a PIM of the data (say using the Relational Data Model), and corresponding PSMs specifying how the data is actually represented on a storage medium based on some particular data storage paradigm etc., and a mapping from the PIM to each PSM.

OMG adopts standard specifications of models that exploit the MDA pattern to facilitate portability, interoperability and reusability, either through ab initio development of standards or by reference to existing standards. Some examples of OMG adopted specifications are:

1. *Languages* – e.g. IDL for interface specification, UML for model specification, OCL for constraint specification, etc.

(6) Mappings – e.g. Mapping of OMG IDL to specific implementation languages (CORBA PIM to Implementation Language PSMs), UML Profile for EDOC (PIM) to CCM (CORBA PSM) and EJB (Java PSM), CORBA (PSM) to COM (PSM) etc.

(7) *Services* – e.g. Naming Service [NS], Transaction Service [OTS], Security Service [SEC], Trading Object Service [TOS] etc.

(8) *Platforms* – e.g. CORBA [CORBA].

(9) *Protocols* – e.g. GIOP/IIOP [CORBA] (both structure and exchange protocol), XML Metadata Interchange [XMI] (structure specification usable as payload on multiple exchange protocols).

(10) *Domain Specific Standards* – e.g. Data Acquisition from Industrial Systems (Manufacturing) [DAIS], General Ledger Specification (Finance) [GLS], Air Traffic Control (Transportation) [ATC], Gene Expression (Life Science Research) [GE], Personal Identification Service (Healthcare) [PIDS], etc.

For an introduction to MDA, see [MDAa]. For a discourse on the details of MDA please refer to [MDAc]. To see an example of the application of MDA see [MDAb]. For general information on MDA, see [MDAd].

Object Management Architecture (OMA) is a distributed object computing platform architecture within MDA that is related to ISO's Reference Model of Open Distributed Processing RM-ODP[RM-ODP]. CORBA and any extensions to it are based on OMA. For information on OMA see [OMA].

3.0 Adoption Process

3.1 Introduction

OMG adopts specifications by explicit vote on a technology-by-technology basis. The specifications selected each satisfy the architectural vision of MDA. OMG bases its decisions on both business and technical considerations. Once a

specification adoption is finalized by OMG, it is made available for use by both OMG members and non-members alike.

Request for Proposals (RFP) are issued by a *Technology Committee* (TC), typically upon the recommendation of a *Task Force* (TF) and duly endorsed by the *Architecture Board* (AB).

Submissions to RFPs are evaluated by the TF that initiated the RFP. Selected specifications are *recommended* to the parent TC after being *reviewed* for technical merit and consistency with MDA and other adopted specifications and *endorsed* by the AB. The parent TC of the initiating TF then votes to *recommend adoption* to the OMG Board of Directors (BoD). The BoD acts on the recommendation to complete the adoption process.

For more detailed information on the adoption process see the *Policies and Procedures of the OMG Technical Process* [P&P] and the *OMG Hitchhiker's Guide* [Guide]. In case of any inconsistency between this document and the [P&P] in all cases the [P&P] shall prevail.

3.2 Steps in the Adoption Process

A TF, its parent TC, the AB and the Board of Directors participate in a collaborative process, which typically takes the following form:

- *Development and Issuance of RFP*

  RFPs are drafted by one or more OMG members who are interested in the adoption of a standard in some specific area. The draft RFP is presented to an appropriate TF, based on its subject area, for approval and recommendation to issue. The TF and the AB provide guidance to the drafters of the RFP. When the TF and the AB are satisfied that the RFP is appropriate and ready for issuance, the TF recommends issuance to its parent TC, and the AB endorses the recommendation. The TC then acts on the recommendation and issues the RFP.

- *Letter of Intent (LOI)*

  A Letter of Intent (LOI) must be submitted to the OMG signed by an officer of the member organization which intends to respond to the RFP, confirming the organization's willingness to comply with OMG's terms and conditions, and commercial availability requirements. (See section 4.3 for more information.). In order to respond to an RFP the organization must be a member of the TC that issued the RFP.

- *Voter Registration*

Interested OMG members, other than Trial, Press and Analyst members, may participate in specification selection votes in the TF for an RFP. They may need to register to do so, if so stated in the RFP. Registration ends on a specified date, 6 or more weeks after the announcement of the registration period. The registration closure date is typically around the time of initial submissions. Member organizations that have submitted an LOI are automatically registered to vote.

- *Initial Submissions*

  Initial Submissions are due by a specified deadline. Submitters normally present their proposals at the first meeting of the TF after the deadline. Initial Submissions are expected to be complete enough to provide insight on the technical directions and content of the proposals.

- *Revision Phase*

  During this time submitters have the opportunity to revise their Submissions, if they so choose.

- *Revised Submissions*

  Revised Submissions are due by a specified deadline. Submitters again normally present their proposals at the next meeting of the TF after the deadline. (Note that there may be more than one Revised Submission deadline. The decision to set new Revised Submission deadlines is made by the registered voters for that RFP.)

- *Selection Votes*

  When the registered voters for the RFP believe that they sufficiently understand the relative merits of the Revised Submissions, a selection vote is taken. The result of this selection vote is a recommendation for adoption to the TC. The AB reviews the proposal for MDA compliance and technical merit. An endorsement from the AB moves the voting process into the issuing Technology Committee. An eight-week voting period ensues in which the TC votes to recommend adoption to the OMG Board of Directors (BoD). The final vote, the vote to adopt, is taken by the BoD and is based on technical merit as well as business qualifications. The resulting draft standard is called the *Alpha Specification*.

- Business Committee Questionnaire

  The submitting members whose proposal is recommended for adoption need to submit their response to the BoD Business Committee Questionnaire [BCQ] detailing how they plan to make use of and/or make the resulting standard available in products. If no organization commits to make use of the

standard, then the BoD will typically not act on the recommendation to adopt the standard - so it is very important to fulfill this requirement.

- Finalization

  A Finalization Task Force (FTF) is chartered by the TC that issued the RFP, to prepare an Alpha submission for publishing as a Formal (i.e. publicly available) specification, by fixing any problems that are reported by early users of the specification. Upon completion of its activity the FTF recommends adoption of the resulting Beta (draft) specification. The parent TC acts on the recommendation and recommends adoption to the BoD. OMG Technical Editors produce the Formal Specification document based on this Beta Specification.

- Revision

  A Revision Task Force (RTF) is normally chartered by a TC, after the FTF completes its work, to manage issues filed against the Formal Specification by implementers and users. The output of the RTF is a Beta specification reflecting minor technical changes, which the TC and Board will usually approve for adoption as the next version of the Formal Specification.

3.3 Goals of the evaluation

The primary goals of the TF evaluation are to:

- Provide a fair and open process
- Facilitate critical review of the submissions by members of OMG
- Provide feedback to submitters enabling them to address concerns in their revised submissions
- Build consensus on acceptable solutions
- Enable voting members to make an informed selection decision

Submitters are expected to actively contribute to the evaluation process.

4.0 Instructions for Submitters

4.1 OMG Membership

To submit to an RFP issued by the Platform Technology Committee the submitter or submitters must be either Platform or Contributing members on the date of the submission deadline, while for Domain Technology RFPs the

submitter or submitters must be either Contributing or Domain members. Submitters sometimes choose to name other organizations that support a submission in some way; however, this has no formal status within the OMG process, and for OMG's purposes confers neither duties nor privileges on the organizations thus named.

4.2 Submission Effort

An RFP submission may require significant effort in terms of document preparation, presentations to the issuing TF, and participation in the TF evaluation process. Several staff months of effort might be necessary. OMG is unable to reimburse submitters for any costs in conjunction with their submissions to this RFP.

4.3 Letter of Intent

A Letter of Intent (LOI) must be submitted to the OMG Business Committee signed by an officer of the submitting organization signifying its intent to respond to the RFP and confirming the organization's willingness to comply with OMG's terms and conditions, and commercial availability requirements. These terms, conditions, and requirements are defined in the *Business Committee RFP Attachment* and are reproduced verbatim in section 4.4 below.

The LOI should designate a single contact point within the submitting organization for receipt of all subsequent information regarding this RFP and the submission. The name of this contact will be made available to all OMG members. The LOI is typically due 60 days before the deadline for initial submissions. LOIs must be sent by fax or paper mail to the "RFP Submissions Desk" at the main OMG address shown on the first page of this RFP.

Here is a suggested template for the Letter of Intent:

This letter confirms the intent of <organization required> (the organization) to submit a response to the OMG <RFP name required> RFP. We will grant OMG and its members the right to copy our response for review purposes as specified in section 4.7 of the RFP. Should our response be adopted by OMG we will comply with the OMG Business Committee terms set out in section 4.4 of the RFP and in document omg/06-03-02.

<contact name and details required> will be responsible for liaison with OMG regarding this RFP response.

The signatory below is an officer of the organization and has the approval and authority to make this commitment on behalf of the organization.

<signature required>

4.4 Business Committee RFP Attachment

This section contains the text of the Business Committee RFP attachment concerning commercial availability requirements placed on submissions. This attachment is available separately as an OMG document omg/06-03-02.

Commercial considerations in OMG technology adoption

A1 Introduction

OMG wishes to encourage rapid commercial adoption of the specifications it publishes. To this end, there must be neither technical, legal nor commercial obstacles to their implementation. Freedom from the first is largely judged through technical review by the relevant OMG Technology Committees; the second two are the responsibility of the OMG Business Committee. The BC also looks for evidence of a commitment by a submitter to the commercial success of products based on the submission.

A2 Business Committee evaluation criteria

A2.1 Viable to implement across platforms

While it is understood that final candidate OMG submissions often combine technologies before they have all been implemented in one system, the Business Committee nevertheless wishes to see evidence that each major feature has been implemented, preferably more than once, and by separate organisations. Pre-product implementations are acceptable. Since use of OMG specifications should not be dependant on any one platform, cross-platform availability and interoperability of implementations should be also be demonstrated.

A2.2 Commercial availability

In addition to demonstrating the existence of implementations of the specification, the submitter must also show that products based on the specification are commercially available, or will be within 12 months of the date when the specification was recommended for adoption by the appropriate Task Force. Proof of intent to ship product within 12 months might include:

- *A public product announcement with a shipping date within the time limit.*

- *Demonstration of a prototype implementation and accompanying draft user documentation.*

Alternatively, and at the Business Committee's discretion, submissions may be adopted where the submitter is not a commercial software provider, and therefore will not make implementations commercially available. However, in this case the BC will require concrete evidence of two or more independent implementations of the specification being used by end- user organisations as part of their businesses. Regardless of which requirement is in use, the submitter must inform the OMG of completion of the implementations when commercially available.

A2.3 Access to Intellectual Property Rights

OMG will not adopt a specification if OMG is aware of any submitter, member or third party which holds a patent, copyright or other intellectual property right (collectively referred to in this policy statement as "IPR") which might be infringed by implementation or recommendation of such specification, unless OMG believes that such IPR owner will grant a license to organisations (whether OMG members or not) on non-discriminatory and commercially reasonable terms which wish to make use of the specification. Accordingly, the submitter must certify that it is not aware of any claim that the specification infringes any IPR of a third party or that it is aware and believes that an appropriate non-discriminatory license is available from that third party. Except for this certification, the submitter will not be required to make any other warranty, and specifications will be offered by OMG for use "as is". If the submitter owns IPR to which an use of a specification based upon its submission would necessarily be subject, it must certify to the Business Committee that it will make a suitable license available to any user on non- discriminatory and commercially reasonable terms, to permit development and commercialisation of an implementation that includes such IPR.

It is the goal of the OMG to make all of its technology available with as few impediments and disincentives to adoption as possible, and therefore OMG strongly encourages the submission of technology as to which royalty-free licenses will be available. However, in all events, the submitter shall also certify that any necessary licence will be made available on commercially reasonable, non-discriminatory terms. The submitter is responsible for disclosing in detail all known restrictions, placed either by the submitter or, if known, others, on technology necessary for any use of the specification.

A2.4 Publication of the specification

Should the submission be adopted, the submitter must grant OMG (and its sublicensees) a world- wide, royalty-free licence to edit, store, duplicate and

distribute both the specification and works derived from it (such as revisions and teaching materials). This requirement applies only to the written specification, not to any implementation of it.

A2.5 Continuing support

The submitter must show a commitment to continue supporting the technology underlying the specification after OMG adoption, for instance by showing the BC development plans for future revisions, enhancement or maintenance.

4.5 Responding to RFP items

4.5.1 Complete proposals

A submission must propose full specifications for all of the relevant requirements detailed in Chapter 6 of this RFP. Submissions that do not present complete proposals may be at a disadvantage.

Submitters are highly encouraged to propose solutions to any optional requirements enumerated in Chapter 6.

4.5.2 Additional specifications

Submissions may include additional specifications for items not covered by the RFP that they believe to be necessary and integral to their proposal. Information on these additional items should be clearly distinguished.

Submitters must give a detailed rationale as to why these specifications should also be considered for adoption. However submitters should note that a TF is unlikely to consider additional items that are already on the roadmap of an OMG TF, since this would pre-empt the normal adoption process.

4.5.3 Alternative approaches

Submitters may provide alternative RFP item definitions, categorizations, and groupings so long as the rationale for doing so is clearly stated. Equally, submitters may provide alternative models for how items are provided if there are compelling technological reasons for a different approach.

4.6 Confidential and Proprietary Information

The OMG specification adoption process is an open process. Responses to this RFP become public documents of the OMG and are available to members and non-members alike for perusal. No confidential or proprietary information of any kind will be accepted in a submission to this RFP.

4.7 Copyright Waiver

Every submission document must contain: (i) a waiver of copyright for unlimited duplication by the OMG, and (ii) a limited waiver of copyright that allows each OMG member to make up to fifty (50) copies of the document for review purposes only. See Section 4.9.2 for recommended language.

4.8 Proof of Concept

Submissions must include a "proof of concept" statement, explaining how the submitted specifications have been demonstrated to be technically viable. The technical viability has to do with the state of development and maturity of the technology on which a submission is based. This is not the same as commercial availability. Proof of concept statements can contain any information deemed relevant by the submitter; for example:

> "This specification has completed the design phase and is in the process of being prototyped."
>
> "An implementation of this specification has been in beta-test for 4 months."
>
> "A named product (with a specified customer base) is a realization of this specification."

It is incumbent upon submitters to demonstrate the technical viability of their proposal to the satisfaction of the TF managing the evaluation process. OMG will favor proposals based on technology for which sufficient relevant experience has been gained.

4.9 Format of RFP Submissions

This section presents the structure of a submission in response to an RFP. *All submissions* must contain the elements itemized in section 4.9.2 below before they can be accepted as a valid response for evaluation or a vote can be taken to recommend for adoption.

4.9.1 General

- Submissions that are concise and easy to read will inevitably receive more consideration.
- Submitted documentation should be confined to that directly relevant to the items requested in the RFP. If this is not practical, submitters must make clear what portion of the documentation pertains directly to the RFP and what portion does not.
- The key words "**must**", "**must not**", "**required**", "**shall**", "**shall not**", "**should**", "**should not**", "**recommended**", "**may**", and "**optional**" shall be used in the submissions with the meanings as described in RFC 2119 [RFC2119].

4.9.2 Required Outline

A three-part structure for submissions is required. Part I is non-normative, providing information relevant to the evaluation of the proposed specification. Part II is normative, representing the proposed specification. Specific sections like Appendices may be explicitly identified as non-normative in Part II. Part III is normative specifying changes that must be made to previously adopted specifications in order to be able to implement the specification proposed in Part II.

PART I

- •A cover page carrying the following information (a template for this is available [Inventory]):
  - The full name of the submission
  - The primary contact for the submission
  - The acronym proposed for the specification (e.g. UML, CORBA)
  - The name and document number of the RFP to which this is a response
  - The document number of the main submission document
  - An inventory of all accompanying documents, with OMG document number, short description, a URL where appropriate, and whether they are normative.
- List of OMG members making the submission (see 4.1) listing exactly which members are making the submission, so that submitters can be matched with LOI responders and their current eligibility can be verified.
- Copyright waiver (see 4.7), in a form acceptable to the OMG.

One acceptable form is:

"Each of the entities listed above: (i) grants to the Object Management Group, Inc. (OMG) a nonexclusive, royalty-free, paid up, worldwide license to copy and distribute this document and to modify this document and distribute copies of the modified version, and (ii) grants to each member of the OMG a nonexclusive, royalty-free, paid up, worldwide license to make up to fifty (50) copies of this document for internal review purposes only and not for distribution, and (iii) has agreed that no person shall be deemed to have infringed the copyright in the included material of any such copyright holder by reason of having used any OMG specification that may be based hereon or having conformed any computer software to such specification."

If you wish to use some other form you must get it approved by the OMG legal counsel before using it in a submission.

- For each member making the submission, an individual contact point who is authorized by the member to officially state the member's position relative to the submission, including matters related to copyright ownership, etc. (see 4.3)
- Overview or guide to the material in the submission
- Overall design rationale (if appropriate)
- Statement of proof of concept (see 4.8)
- Resolution of RFP requirements and requests

  Explain how the proposal satisfies the specific requirements and (if applicable) requests stated in Chapter 6. References to supporting material in Part II should be given.

  In addition, if the proposal does not satisfy any of the general requirements stated in Chapter 5, provide a detailed rationale.

- Responses to RFP issues to be discussed

  Discuss each of the "Issues To Be Discussed" identified in Chapter 6.

PART II

The contents of this part should be structured based on the template found in [FORMS] and should contain the following elements as per the instructions in the template document cited above:

- Scope of the proposed specification

- Proposed conformance criteria

  Submissions should propose appropriate conformance criteria for implementations.

- Proposed normative references

  Submissions should provide a list of the normative references that are used by the proposed specification

- Proposed list of terms and definitions

  Submissions should provide a list of terms that are used in the proposed specification with their definitions.

- Proposed list of symbols

  Submissions should provide a list of special symbols that are used in the proposed specification together with their significance

- Proposed specification

PART III

- Changes or extensions required to existing OMG specifications

  Submissions must include a full specification of any changes or extensions required to existing OMG specifications. This should be in a form that enables "mechanical" section-by-section revision of the existing specification.

4.10 How to Submit

Submitters should send an electronic version of their submission to the *RFP Submissions Desk* (*omg-documents@omg.org*) at OMG Headquarters by 5:00 PM U.S. Eastern Standard Time (22:00 GMT) on the day of the Initial and Revised Submission deadlines. Acceptable formats are Adobe FrameMaker source, ODF (ISO/IEC 26300), OASIS Darwin Information Typing Architecture (DITA) or OASIS DocBook 4.x (or later).

Submitters should make sure they receive electronic or voice confirmation of the successful receipt of their submission. Submitters should be prepared to send a single hardcopy version of their submission, if requested by OMG staff, to the attention of the "RFP Submissions Desk" at the main OMG address shown on the first page of this RFP.

5.0 General Requirements on Proposals

5.1 Requirements

5.1.1 Submitters are encouraged to express models using OMG modeling languages such as UML, MOF, CWM and SPEM (subject to any further constraints on the types of the models and modeling technologies specified in Chapter 6 of this RFP). Submissions containing models expressed via OMG modeling languages shall be accompanied by an OMG XMI [XMI] representation of the models (including a machine-readable copy). A best effort should be made to provide an OMG XMI representation even in those cases where models are expressed via non-OMG modeling languages.

5.1.2 Chapter 6 of this RFP specifies whether PIM(s), PSM(s), or both are being solicited. If proposals specify a PIM and corresponding PSM(s), then the rules specifying the mapping(s) between the PIM and PSM(s) shall either be identified by reference to a standard mapping or specified in the proposal. In order to allow possible inconsistencies in a proposal to be resolved later, proposals shall identify whether the mapping technique or the resulting PSM(s) are to be considered normative.

5.1.3 Proposals shall be *precise* and *functionally complete*. All relevant assumptions and context required for implementing the specification shall be provided.

5.1.4 Proposals shall specify *conformance criteria* that clearly state what features all implementations must support and which features (if any) may *optionally* be supported.

5.1.5 Proposals shall *reuse* existing OMG and other standard specifications in preference to defining new models to specify similar functionality.

5.1.6 Proposals shall justify and fully specify any *changes or extensions* required to existing OMG specifications. In general, OMG favors proposals that are *upwards compatible* with existing standards and that minimize changes and extensions to existing specifications.

5.1.7 Proposals shall factor out functionality that could be used in different contexts and specify their models, interfaces, etc. separately. Such *minimalism* fosters re-use and avoids functional duplication.

5.1.8 Proposals shall use or depend on other specifications only where it is actually necessary. While re-use of existing specifications to avoid duplication will be encouraged, proposals should avoid gratuitous use.

5.1.9 Proposals shall be *compatible* with and *usable* with existing specifications from OMG and other standards bodies, as appropriate. Separate specifications offering distinct functionality should be usable together where it makes sense to do so.

5.1.10 Proposals shall preserve maximum *implementation flexibility*. Implementation descriptions should not be included and proposals shall not constrain implementations any more than is necessary to promote interoperability.

5.1.11 Proposals shall allow *independent implementations* that are *substitutable* and *interoperable*. An implementation should be replaceable by an alternative implementation without requiring changes to any client.

5.1.12 Proposals shall be compatible with the architecture for system distribution defined in ISO's Reference Model of Open Distributed Processing [RM-ODP]. Where such compatibility is not achieved, or is not appropriate, the response to the RFP must include reasons why compatibility is not appropriate and an outline of any plans to achieve such compatibility in the future.

5.1.13 In order to demonstrate that the specification proposed in response to this RFP can be made secure in environments requiring security, answers to the following questions shall be provided:

- What, if any, are the security sensitive elements that are introduced by the proposal?
- Which accesses to security-sensitive elements must be subject to security policy control?
- Does the proposed service or facility need to be security aware?
- What default policies (e.g., for authentication, audit, authorization, message protection etc.) should be applied to the security sensitive elements introduced by the proposal? Of what security considerations must the implementers of your proposal be aware?

The OMG has adopted several specifications, which cover different aspects of security and provide useful resources in formulating responses. [CSIV2] [SEC] [RAD].

5.1.14 Proposals shall specify the degree of internationalization support that they provide. The degrees of support are as follows:

a) Uncategorized: Internationalization has not been considered.

b) Specific to <region name>: The proposal supports the customs of the specified region only, and is not guaranteed to support the customs of any other region. Any fault or error caused by requesting the services outside of a context in which the customs of the specified region are being consistently followed is the responsibility of the requester.

c) Specific to <multiple region names>: The proposal supports the customs of the specified regions only, and is not guaranteed to support the customs of any other regions. Any fault or error caused by requesting the services outside of a context in which the customs of at least one of the specified regions are being consistently followed is the responsibility of the requester.

d) Explicitly not specific to <region(s) name>: The proposal does not support the customs of the specified region(s). Any fault or error caused by requesting the services in a context in which the customs of the specified region(s) are being followed is the responsibility of the requester.

5.2 Evaluation criteria

Although the OMG adopts model-based specifications and not implementations of those specifications, the technical viability of implementations will be taken into account during the evaluation process. The following criteria will be used:

5.2.1 Performance

Potential implementation trade-offs for performance will be considered.

5.2.2 Portability

The ease of implementation on a variety of systems and software platforms will be considered.

5.2.3 Securability

The answer to questions in section 5.1.13 shall be taken into consideration to ascertain that an implementation of the proposal is securable in an environment requiring security.

5.2.4 Conformance: Inspectability and Testability

The adequacy of proposed specifications for the purposes of conformance inspection and testing will be considered. Specifications should provide sufficient constraints on interfaces and implementation characteristics to ensure

that conformance can be unambiguously assessed through both manual inspection and automated testing.

5.2.5 Standardized Metadata

Where proposals incorporate metadata specifications, usage of OMG standard XMI metadata [XMI] representations must be provided as this allows specifications to be easily interchanged between XMI compliant tools and applications. Since use of XML (including XMI and XML/Value [XML/Value]) is evolving rapidly, the use of industry specific XML vocabularies (which may not be XMI compliant) is acceptable where justified.

6.0 Specific Requirements on Proposals

6.1 Problem Statement

Generally, most component-based software platforms have their own specifications for component deployment and configuration. We already have the Robotic Technology Component (RT-Component: RTC) Specification in the OMG for a component-based robot software platform. The component model for robotics domain-specific design patterns is described in the current RTC specification. However, functionality such as deployment and configuration, which are usually supported by middleware services or facilities, are not defined.

As the general UML component model has been extended in the RTC specification, in order to apply it to the robotics domain, some services and facilities also should be extended with robot-specific characteristics. Existing specifications are inadequate to meet the requirements of robotics. They are general purpose and are oriented toward static software systems, not dynamic software systems such as robotic systems. This RFP describes deployment and dynamic reconfiguration specific to RT components.

A robot is a mobile system that interacts with the real environment. Figure 1 shows the typical robotic application environment. A robot moves around from one place to another in the dynamic environment and it can use the environment's resources, which include sensors, robotic devices and other robots.

In the robot application development phase, we may not know what environment the robot will be installed to and, furthermore, what environment changes will occur while the robot is operating. These dynamic characteristics should be considered not at software build-time but at runtime. This means that RTC-based systems can be deployed and reconfigured at runtime according to environment changes. Therefore a new flexible, adaptive, and dynamically configurable mechanism and method are required to meet the dynamic characteristics of robotic applications.

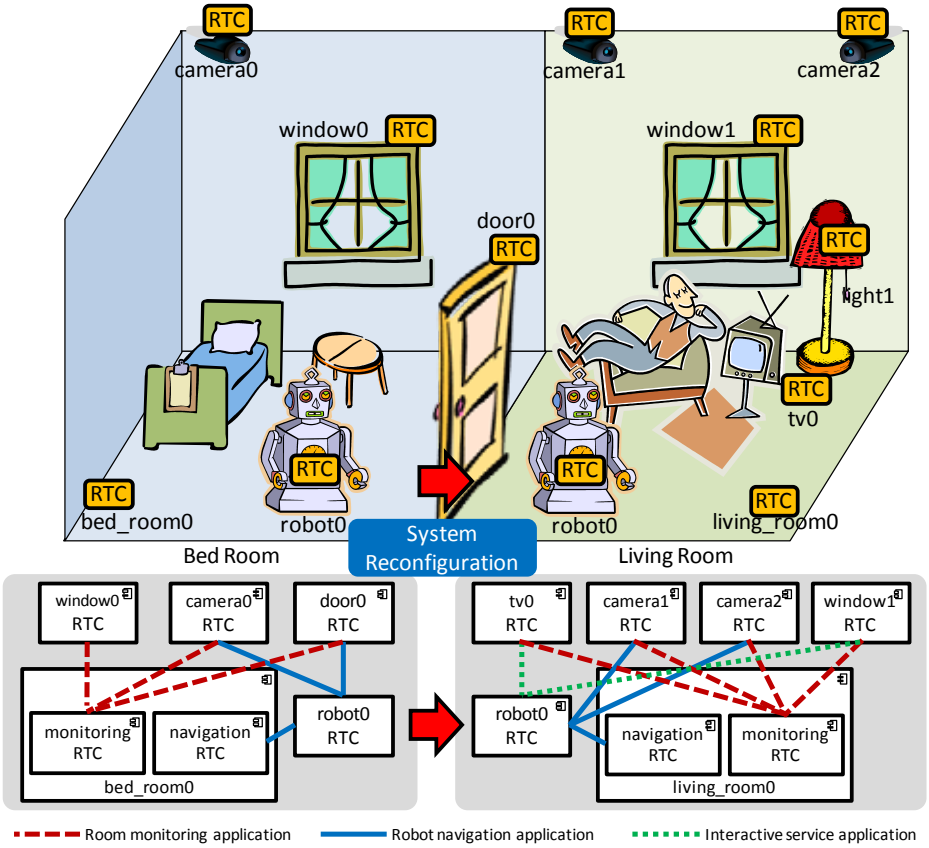


Figure 1 Typical robotic application environment

In order to address functionality of deployment and dynamic reconfiguration, the following issues should be included:

1. RT component profile

A component can generally have common profile information, and as shown in Figure 2, this profile information can be used in the component development phase, system development phase, simulation, and so on. Furthermore, when using a repository server that accumulates a lot of components, this information can be utilized for storing, searching and retrieving components from it. This is called a component profile.

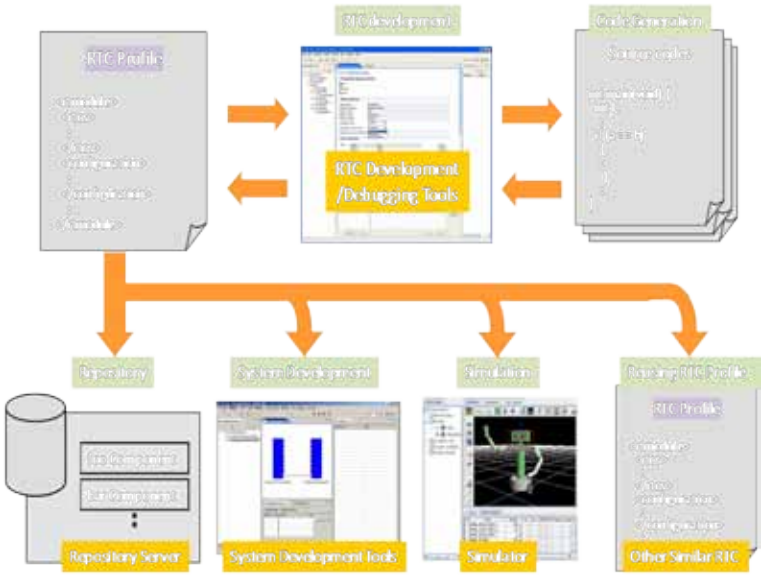


Figure 2 Use of the RT Component Profile

2. RTC-based system profile

An RTC-based system is generally built by composing the RT components or RTC based subsystems. An RTC-based system or subsystem shall consist of connection information among RTCs, configuration information for RTCs, and so on. This information is called an RTC-based system profile. As shown in Figure 3, this information can be utilized for simulation or component deployment for actual systems. Usually, the components are installed on the target system prior to starting it. (Here, we are focusing on static systems only. The dynamic case will be addressed in the following issues.) Therefore, the person who wants to deploy components has to prepare all the components that constitute the target system. Also, as the number of RT components and component developers (or developing organizations) is increasing, the person in charge of deployment cannot personally manage all the components that are built. In these cases, a central repository, which manages all the components built, is very helpful in deploying to robot systems. It enables people who want to deploy components to search for what they want in the repository and download/install the components found onto the target hardware. Moreover, if they describe the composing components in a computer-understandable form, the RT middleware is now able to automatically search, download, and install the components while deploying the system.

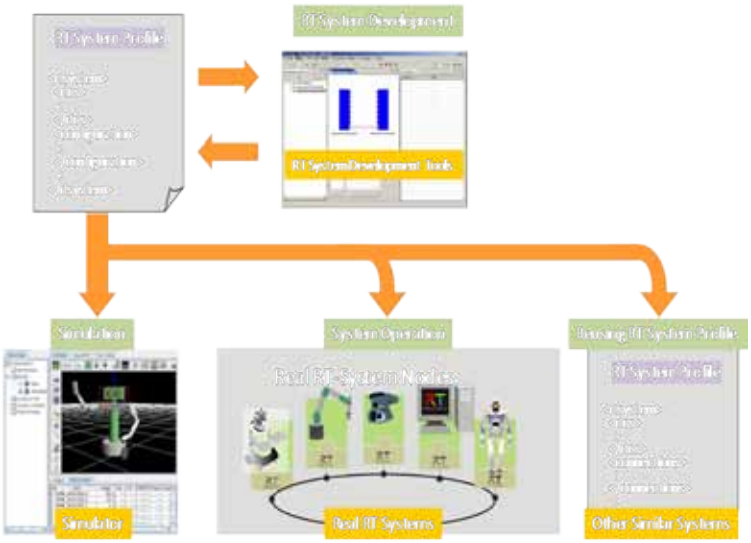


Figure 3 Use of RTC-based system profile

3. RTC-based system deployment

The current RTC specification does not cover a declarative way to compose RT components to build a robotic application or system. Many component systems present their deployment descriptions that can describe the target application (or system) by combining their components. However those descriptions are not suitable for the robotics domain, which inherently suffers from environment changes during operation time due to mobility. Links between components established at deployment time become obsolete as a robot moves to a new environment. In order to handle these situations, the method of describing the links should be declarative enough such that the description remains valid as the surrounding environment changes over time.

A robot consists of different kinds of sensor and actuator devices and usually includes multiple computing nodes. The RTC-based system should consider the automated deployment of RTCs to the distributed nodes. However, the existing RTC specification suffers from insufficient support for deployment and configuration of software components of distributed applications.

4. RTC instance lookup

As mentioned above, a robotic application (or system) consists of RTCs and links among them. Here, the components which are participating in the link are not limited to a single node (or host) but are placed on separate nodes. In this case, it is necessary to search for appropriate component instances running throughout the distributed system. To fulfill these requirements, the specification should provide an RTC directory, which is in charge of searching for a candidate component instance to be linked with another component instance. Since it is desired that the component instance search is meta-

information based, the specification must also define the data model for meta-information of the component instances. Finally, in order for the RTC directory to find the right component instance that matches the requirements, all the meta-information of the component instances running throughout the distributed system must be known to the directory. Therefore the specification also specifies the registering (and conversely unregistering) processes by which all component instances register their own meta-information with the directory.

5. RT component instance tracking

As mentioned earlier, robotic systems have a unique characteristic in that their surrounding context may change during operation time. In such cases, a link between component instances could become invalid, and so need to be removed and re-established between different component instances. This kind of reconfiguration commonly results from the impairment of the participating component instances and/or changes in the robot location. To support such reconfiguration, the robotic application (or system) needs to be notified whenever the situation changes. Since not all changes require reconfiguration, it must be possible to specify the specific environment changes that trigger reconfiguration. It is desirable that the specification is also based on meta-information of component instances and looks similar to that for the component instance searching.

We already have the RTC specification in the OMG for the reusability and interoperability of robot modules. We also have the DEPL specification in the OMG for deployment and configuration of component based distributed applications.

RTC defines a component model and infrastructure services applicable to the domain of robotics software development. By extending the general-purpose component functionality of UML with direct support for domain-specific structural and behavioral design patterns, RTCs serve as powerful building blocks in an RTC-based system. RTC provides the way to make RT components and build RTC-based systems. However, it does not discuss how to deploy and reconfigure RT components at runtime.

DEPL defines installation, configuration, planning, preparation, and launch process for component-based applications. DEPL could support the deployment and configuration of components at build time. However it cannot cover the deployment and reconfiguration of components at run time and meet the dynamic characteristics for robotic systems.

To use DEPL in the robotics domain and expand RTC, the RFP proposes the specifications for the deployment and dynamic reconfiguration specific to RT components.

6.2 Scope of Proposals Sought

This RFP solicits proposals to specify common interfaces and common data models for the RTC deployment and dynamic reconfiguration which is specific and competent to robot applications. The proposals shall include a PIM, using UML 2.2, and one or more PSMs, including one based on CORBA IDL and XML.

The proposed specification shall provide functionality for component deployment and dynamic system reconfiguration for RTC based systems. The specification must be general enough to allow a variety of robotic systems to be easily constructed, and must be provide for interoperability.

It is necessary to consider the following in the specification:

(1) The repository service interfaces for storing, searching, and retrieving RT components, and the data model for the component profile description. The component profile might be extensible to include related hardware's functional, mechanical, electrical, physical or geometrical information. This information is helpful in the design and simulation processes.

(2) The repository service interfaces for storing, searching, and retrieving RTC-based applications, and the data model for the RTC-based system profile description**.**

(3) The service interfaces for the deployment of RTCs into the nodes that constitute RTC-based systems at run time, and the data model for describing the details of deployment.

(4) The directory service interfaces for RTC instance discovery, and the data model for describing the RTC instance. In addition to functions such as registration and searching, this service might provide certain functionality such as notifying environmental changes to RTC based applications or filtering such events based on previously registered condition.

6.3 Relationship to other OMG Specifications and activities

6.3.1 Relationship to OMG specifications

- Platform Independent Model and Platform Specific Model for super Distributed Object Specification Version 1.1 [formal/2008-10-01]

- Robotic Technology Component Specification Version 1.0 [formal/2008-04-04]
- Deployment and Configuration of Component-based Distributed Applications Specification OMG Available Specification Version 4.0 [formal/2006-04-02]
- Unified Modeling Language: Infrastructure Version 2.2 [formal/2009-02-04]
- Unified Modeling Language: Superstructure Version 2.2 [formal/2009-02-02]
- Meta Object Facility (MOF) Core Specification OMG Available Specification Version 2.0 [formal/06-01-01]
- Common Object Request Broker Architecture (CORBA/IIOP) 3.1 [formal/2008-01-04, formal/2008-01-06, formal/2008-01-08]
- CORBA Component Model OMG Available Specification Version 4.0 [formal/2006-04-01]
- Lightweight Services Specification Version 1.0 [formal/04-10-01]
- Event Service Specification Version 1.2 [formal/04-10-02]
- Naming Service Specification Version 1.3 [formal/04-10-03]
- Enhanced View of Time Specification Version 1.2 [formal/04-10-04]
- Property Service Specification Version 1.0 [formal/00-06-22]
- Mobile Agent Facility Specification Version 1.0 [formal/2000-01-02]

6.3.2 Relationship to other OMG Documents and work in progress

- UML Profile for MARTE: Modeling and Analysis of Real-Time Embedded systems, beta 3 – convenience document with change bars [ptc/09-05-13]
- MARTE model library XMI file [ptc/09-05-16]
- MARTE Profile XMI file [ptc/09-05-15]

6.4 Related non-OMG Activities, Documents and Standards

- CLARAty: Coupled Layer Architecture for Robotic Autonomy http://robotics.jpl.nasa.gov/tasks/claraty/homepage.html
- Network Robot Forum http://www.scat.or.jp/nrf/
- IEEE Robotics and Automation Society, Technical Committee on Network Robot
- IEEE Robotics and Automation Society, Technical Committee on Programming Environments in Robotics and Automation
- OpenRT Platform http://www.openrtp.jp
- OpenRTM-aist http://www.openrtm.org
- OpenRAVE: http://openrave.programmingvision.com
- OPRoS: http://www.opros.or.kr
- OROCOS: Open Robot Control Software, Open Realtime Control Service http://www.orocos.org/
- Orca: http://orca-robotics.sourceforge.net/
- ORiN :Open Robot/Resource Interface for the Network: http://www.orin.jp/
- Player/Stage: http://playerstage.sourceforge.net/
- Ptolemy Project: http://ptolemy.eecs.berkeley.edu/
- RCS (Realtime Control Systems Architecture): http://www.isd.mel.nist.gov/projects/rcs/
- ROS: http://www.ros.org
- RSi: Robot Service Initiative: http://www.robotservice.org/
- RT middleware Project: http://www.is.aist.go.jp/rt
- SAE AADL (Society for Automotive Engineers, Architecture Analysis and Design Language): http://www.aadl.info/
- RETF (Robotics Engineering Task Force): http://www.robo-etf.org/

- URC (Ubiquitous Robotic Companion) Project
- Yaorozu Project: http://www.8mg.jp/

6.5 Mandatory Requirements

For all the mandatory requirements, proposals shall provide a Platform Independent Model (PIM) and at least one CORBA-specific model or XML schema for RTC Deployment and Dynamic Reconfiguration. The models shall meet the following requirements.

- Proposals shall specify common interfaces for storing, searching and retrieving RTCs, and shall also provide data models describing RTC profiles.
- Proposals shall specify common interfaces for storing, searching and retrieving RT component-based applications, and shall also provide data models for RTC-based system profile describing RTCs connection structure. The interfaces for searching appropriate RT component instances. The scope of the search shall not be restricted to a single host.
- Proposals shall specify a common interface for RTC deployment into the nodes that constitute an RTC-based system, and shall also provide the data models for describing the details of deployment.
- Proposals shall specify common interfaces for RTC registration, searching, discovery and notification of environmental changes.

6.6 Optional Requirements

- None

6.7 Issues to be discussed

These issues will be considered during submission evaluation. They should not be part of the proposed normative specification. (Place them in Part I of the submission.)

- Proposals shall demonstrate its feasibility by using a specific application based on the proposed model.
- Proposals shall demonstrate its applicability to existing technology such as the RTC specification [RTC].
- Proposals shall discuss simplicity of implementation.

- Proposals shall discuss the possibility of applying the proposed model to other existing fields/projects of interest that deploy components such as EJB, CCM , SCA, DEPL and other well-known component models.

- Proposals shall discuss the possibility of providing a standard mechanism for advertising, querying component instances and receiving change notifications

- Proposals shall discuss their relation to and dependency on existing communication protocols or middleware standards, such as CORBA [CORBA] or DDS [DDS].

6.8 Evaluation Criteria

Proposals will be evaluated in terms of consistency in their specifications, feasibility and versatility across a wide range of different robot applications.

6.9 Other information unique to this RFP

None.

6.10 RFP Timetable

The timetable for this RFP is given below. Note that the TF or its parent TC may, in certain circumstances, extend deadlines while the RFP is running, or may elect to have more than one Revised Submission step. The latest timetable can always be found at the OMG *Work In Progress* page at http://www.omg.org/schedules under the item identified by the name of this RFP.

Event or Activity	Actual Date
Preparation of RFP by TF	
RFP placed on OMG document server	*February 22nd, 2010*
Approval of RFP by Architecture Board *Review by TC*	*March, 2010*
TC votes to issue RFP	*March, 2010*
LOI to submit to RFP due	*June, 2010*
Initial Submissions due and placed on OMG document server ("Four week rule")	*August 23rd, 2010*
Voter registration closes	*September, 2010*
Initial Submission presentations	*September, 2010*

Preliminary evaluation by TF	
Revised Submissions due and placed on OMG document server ("Four week rule")	*February 21st, 2011*
Revised Submission presentations	*March, 2011*
Final evaluation and selection by TF *Recommendation to AB and TC*	
Approval by Architecture Board *Review by TC*	
TC votes to recommend specification	*March, 2011*
BoD votes to adopt specification	*June, 2011*

Appendix A References and Glossary Specific to this RFP

A.1 References Specific to this RFP

[CCM] CORBA Components Specification, http://www.omg.org/technology/documents/formal/components.htm

[DDS] Data Distribution Services Specification, http://www.omg.org/spec/DDS/1.2/

[DEPL] Deployment and Configuration of Component-based Distributed Applications Specification OMG Available Specification, http://www.omg.org/spec/DEPL/4.0/

[RTC] Robotic Technology Component specification, http://www.omg.org/spec/RTC/1.0/

[SDO] Super distributed Object Specification, http://www.omg.org/spec/SDO/1.1/

A.2 Glossary Specific to this RFP

Robot application –A software application that controls a robot's behavior. Examples include a vacuum cleaning robot and a butler robot.

Super Distributed Object (SDO) – A logical representation of a hardware device or a software component that provides well-known functionality and services.

Robotic Technology Component (RTC) –A logical representation of a hardware and/or software entity that provides well-known functionality and services.

RTC-based system –A system comprised of RTCs connected in a network representing a robotic system, including robot hardware and software algorithms.

Robotic Technology (RT) – Robotic Technology (RT) is a general term of the technology originating in robotics, and it means not only the standalone robot but technical element which constitutes robots.

RT-component profile – A description that represents the static state of an RT Component that is referred to other RT Components.

RTC-based system profile - A description of how RT-components are connected and interact with each other, and RT-component configuration parameters.

Deployment profile - A description of information used in deploying components, including RT-component profiles.

Meta-information – Data that represents the properties of running RT component instance.

Directory – A storage that manages the references and the meta-information of running RT component instances.

Environment change – Situation that available resources in environment are changed such as sensors, actuators, and other robots, when a robotic system moves to new environment.

Deployment - all of the activities that make a set of components available for use and consist of installation and activation of the components.

Appendix B General Reference and Glossary

B.1 General References

The following documents are referenced in this document:

[ATC] Air Traffic Control
Specification, *http://www.omg.org/technology/documents/formal/air_traffic_control.htm*

[BCQ] OMG Board of Directors Business Committee Questionnaire, http://doc.omg.org/bc/07-08-06

[CCM] CORBA Core Components Specification, *http://www.omg.org/technology/documents/formal/components.htm*

[CORBA] Common Object Request Broker Architecture (CORBA/IIOP), *http://www.omg.org/technology/documents/formal/corba_iiop.htm*

[CSIV2] [CORBA] Chapter 26

[CWM] Common Warehouse Metamodel Specification, *http://www.omg.org/technology/documents/formal/cwm.htm*

[DAIS] Data Acquisition from Industrial Systems, *http://www.omg.org/technology/documents/formal/dais.htm*

[EDOC] UML Profile for EDOC Specification, *http://www.omg.org/techprocess/meetings/schedule/UML_Profile_for_EDOC_FTF.html*

[EJB] "Enterprise JavaBeans™", *http://java.sun.com/products/ejb/docs.html*

[FORMS] "ISO PAS Compatible Submission Template". *http://www.omg.org/cgi-bin/doc?pas/2003-08-02*

[GE] Gene Expression, *http://www.omg.org/technology/documents/formal/gene_expression.htm*

[GLS] General Ledger Specification , *http://www.omg.org/technology/documents/formal/gen_ledger.htm*

[Guide] The OMG Hitchhiker's Guide,, *http://www.omg.org/cgi-bin/doc?hh*

[IDL] ISO/IEC 14750 also see [CORBA] Chapter 3.

[IDLC++] IDL to C++ Language Mapping, *http://www.omg.org/technology/documents/formal/c++.htm*

[Inventory] Inventory of Files for a Submission/Revision/Finalization, *http://doc.omg.org/smsc/2007-09-05*

[MDAa] OMG Architecture Board, "Model Driven Architecture - A Technical Perspective*", http://www.omg.org/mda/papers.htm*

[MDAb] "Developing in OMG's Model Driven Architecture (MDA)," *http://www.omg.org/docs/omg/01-12-01.pdf*

[MDAc] "MDA Guide" (*http://www.omg.org/docs/omg/03-06-01.pdf*)

[MDAd] "MDA "The Architecture of Choice for a Changing World™"", *http://www.omg.org/mda*

[MOF] Meta Object Facility Specification, *http://www.omg.org/technology/documents/formal/mof.htm*

[MQS] "MQSeries Primer", *http://www.redbooks.ibm.com/redpapers/pdfs/redp0021.pdf*

[NS] Naming Service, *http://www.omg.org/technology/documents/formal/naming_service.htm*

[OMA] "Object Management Architecture™", *http://www.omg.org/oma/*

[OTS] Transaction Service, *http://www.omg.org/technology/documents/formal/transaction_service.htm*

[P&P] Policies and Procedures of the OMG Technical Process*, http://www.omg.org/cgi-bin/doc?pp*

[PIDS] Personal Identification Service, *http://www.omg.org/technology/documents/formal/person_identification_service.htm*

[RAD] Resource Access Decision Facility, *http://www.omg.org/technology/documents/formal/resource_access_decision.htm*

[RFC2119] IETF Best Practices: Key words for use in RFCs to Indicate Requirement Levels, (*http://www.ietf.org/rfc/rfc2119.txt)*.

[RM-ODP] ISO/IEC 10746

[SEC] CORBA Security Service, *http://www.omg.org/technology/documents/formal/security_service.htm*

[TOS] Trading Object Service, *http://www.omg.org/technology/documents/formal/trading_object_service.htm*

[UML] Unified Modeling Language Specification, *http://www.omg.org/technology/documents/formal/uml.htm*

[UMLC] UML Profile for CORBA, *http://www.omg.org/technology/documents/formal/profile_corba.htm*

[XMI] XML Metadata Interchange Specification, *http://www.omg.org/technology/documents/formal/xmi.htm*

[XML/Value] XML Value Type Specification, *http://www.omg.org/technology/documents/formal/xmlvalue.htm*

B.2 General Glossary

Architecture Board (AB) - The OMG plenary that is responsible for ensuring the technical merit and MDA-compliance of RFPs and their submissions.

Board of Directors (BoD) - The OMG body that is responsible for adopting technology.

Common Object Request Broker Architecture (CORBA) - An OMG distributed computing platform specification that is independent of implementation languages.

Common Warehouse Metamodel (CWM) - An OMG specification for data repository integration.

CORBA Component Model (CCM) - An OMG specification for an implementation language independent distributed component model.

Interface Definition Language (IDL) - An OMG and ISO standard language for specifying interfaces and associated data structures.

Letter of Intent (LOI) - A letter submitted to the OMG BoD's Business Committee signed by an officer of an organization signifying its intent to

respond to the RFP and confirming the organization's willingness to comply with OMG's terms and conditions, and commercial availability requirements.

Mapping - Specification of a mechanism for transforming the elements of a model conforming to a particular metamodel into elements of another model that conforms to another (possibly the same) metamodel.

Metadata - Data that represents models. For example, a UML model; a CORBA object model expressed in IDL; and a relational database schema expressed using CWM.

Metamodel - A model of models.

Meta Object Facility (MOF) - An OMG standard, closely related to UML, that enables metadata management and language definition.

Model - A formal specification of the function, structure and/or behavior of an application or system.

Model Driven Architecture (MDA) - An approach to IT system specification that separates the specification of functionality from the specification of the implementation of that functionality on a specific technology platform.

Normative – Provisions that one must conform to in order to claim compliance with the standard. (as opposed to non-normative or informative which is explanatory material that is included in order to assist in understanding the standard and does not contain any provisions that must be conformed to in order to claim compliance).

Normative Reference – References that contain provisions that one must conform to in order to claim compliance with the standard that contains said normative reference.

Platform - A set of subsystems/technologies that provide a coherent set of functionality through interfaces and specified usage patterns that any subsystem that depends on the platform can use without concern for the details of how the functionality provided by the platform is implemented.

Platform Independent Model (PIM) - A model of a subsystem that contains no information specific to the platform, or the technology that is used to realize it.

Platform Specific Model (PSM) - A model of a subsystem that includes information about the specific technology that is used in the realization of it on a specific platform, and hence possibly contains elements that are specific to the platform.

Request for Information (RFI) - A general request to industry, academia, and any other interested parties to submit information about a particular technology area to one of the OMG's Technology Committee subgroups.

Request for Proposal (RFP) - A document requesting OMG members to submit proposals to an OMG Technology Committee. Such proposals must be received by a certain deadline and are evaluated by the issuing Task Force.

Task Force (TF) - The OMG Technology Committee subgroup responsible for issuing a RFP and evaluating submission(s).

Technology Committee (TC) - The body responsible for recommending technologies for adoption to the BoD. There are two TCs in OMG – the *Platform TC* (PTC) focuses on IT and modeling infrastructure related standards; while the *Domain TC* (DTC) focuses on domain specific standards.

Unified Modeling Language (UML) - An OMG standard language for specifying the structure and behavior of systems. The standard defines an abstract syntax and a graphical concrete syntax.

UML Profile - A standardized set of extensions and constraints that tailors UML to particular use.

XML Metadata Interchange (XMI) - An OMG standard that facilitates interchange of models via XML documents.

Robotics DTF Function Service WG

OMG User Identification Service Interface

Dr. Su Young, Chi,
Dr. Jaeyeon Lee
ETRI
2009-12-08

HRI is one of the most critical robot capabilities

Many researchers are developing various HRI technologies

such as,

- Speech Recognition
- Face Detection & Recognition
- Speaker Recognition
- User Tracking & Following
- Sound Source Localization
- etc., etc.,…

Many people agree that HRI is essential
in the breakthrough of the Robot Industry

However…

Current robots have very limited HRI capabilities…

Then, why are the technologies are NOT adopted to the real robots more prevalently?

One of the obvious answers is the low performance of the provided technologies

BUT… Is that all?

3

Who are the users of the HRI technologies?

Researcher
Creates HRI Algorithms

Application Programmer
Creates robot services

End User
Enjoys it

4

How the HRI technologies have been provided?

Component Model: Every Single algorithm is embodied as a function in a library

Coordination between components is delegated to the application programmers who do NOT have expertise about the component details

BioAPI is based on this component model.
But the problem BioAPI tries to solve is far simpler than HRI capabilities.

5

However…

Researchers have thought that if the good components are provided, application programmers can do the rest. But it was not the case.

Application programmers …

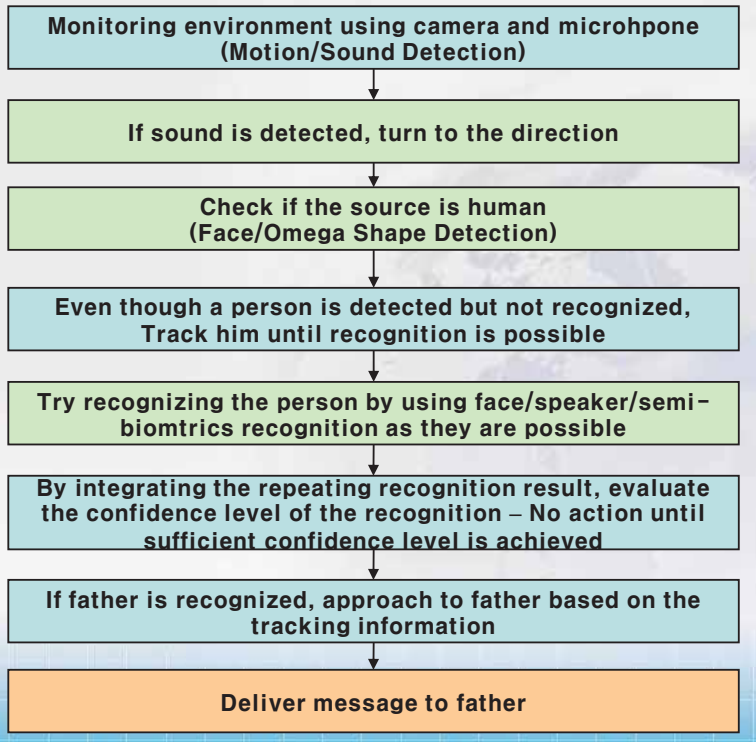
1. Do not know the images formats, details in it. Even they do not want to know.
2. Sound format? The same.
3. Do not understand clearly when and which component should be called.
4. Cooperation between components? It is not an expertise of them.

What the application programmers want to know

1. If a person appears, notify it
2. It is better if the notification includes the information such as who he is, where he is, what he is doing.
3. If that person goes away, notify it
4. If there is a sound, notify that from where the sound comes from, whose voice is it, what he is saying.
5. Application programmers do not mind what kind of sophisticated technologies are being used to do that.

In Component Model, application programmer should do all

As father returns home, the robot delivers the e-mail arrived an hour ago



Sound Source Localization

Human Detection

Tracking

User Recognition

Multimodal Fusion

New model for HRI Technology delivery is needed

Various HRI algorithms cooperate to recognize the environment in an independent process which is called **HRI DEMON**.

Application programmers do NOT need to know the details of the HRI Demon. That is, HRI capabilities are encapsulated in HRI Demon.

HRI communicates with the application programmers through **EVENT, QUERY and REQUEST**

What is HRI Demon?

A Process that actively gather and manage the information that application programmers need by applying various HRI components effectively.

How HRI Demon communicate with the Application?

Event

Notify information that application programmer may be interested to the application

(A person appeared in left 40 degrees direction, The person recognized, He walked to the right, He waves at me, Some person on the right said ‘Come to me’)

Query

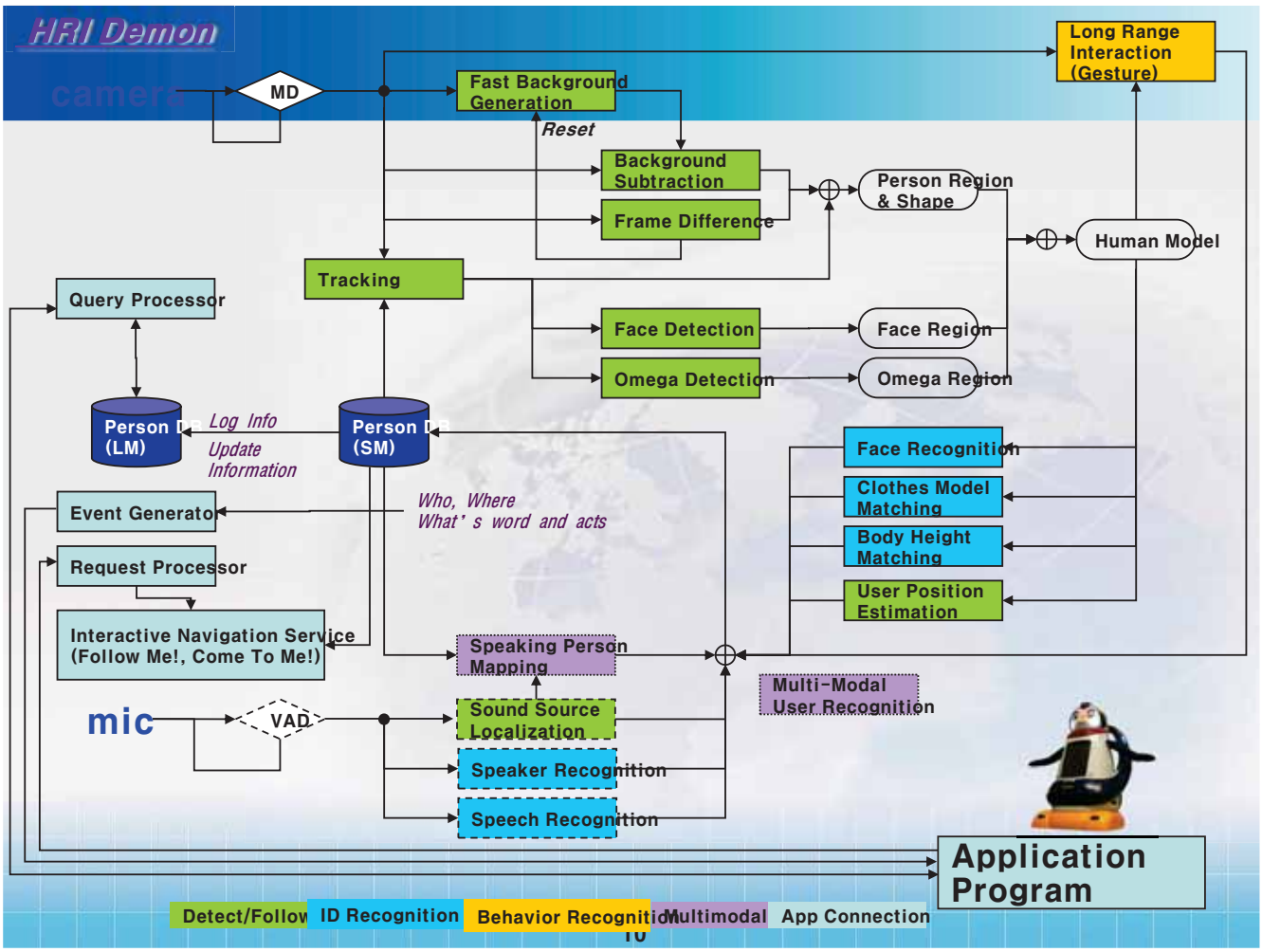
HRI Demon manages the user information. So, the application can ask question

(To the query ‘Where is father?’ Demon can answer ‘He went to the right direction 5 minutes ago’)

Request

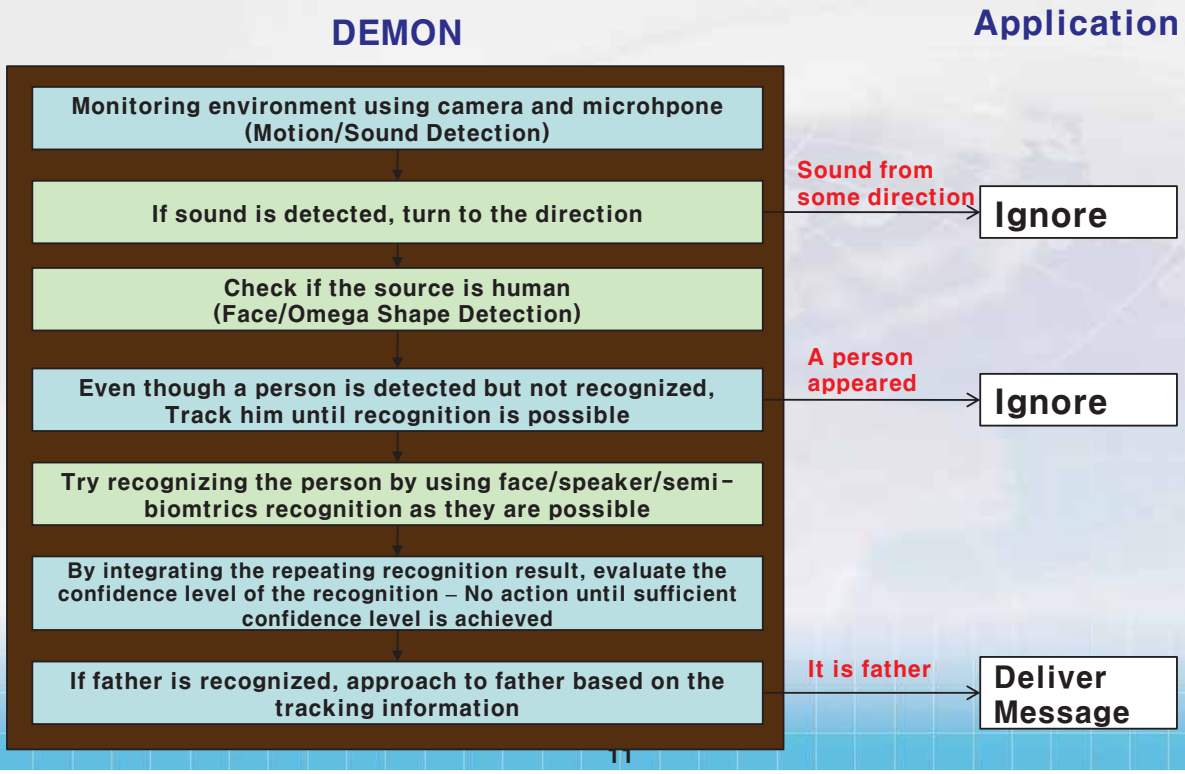
Application can request specific operation to Demon

(Follow father, Go to mother)



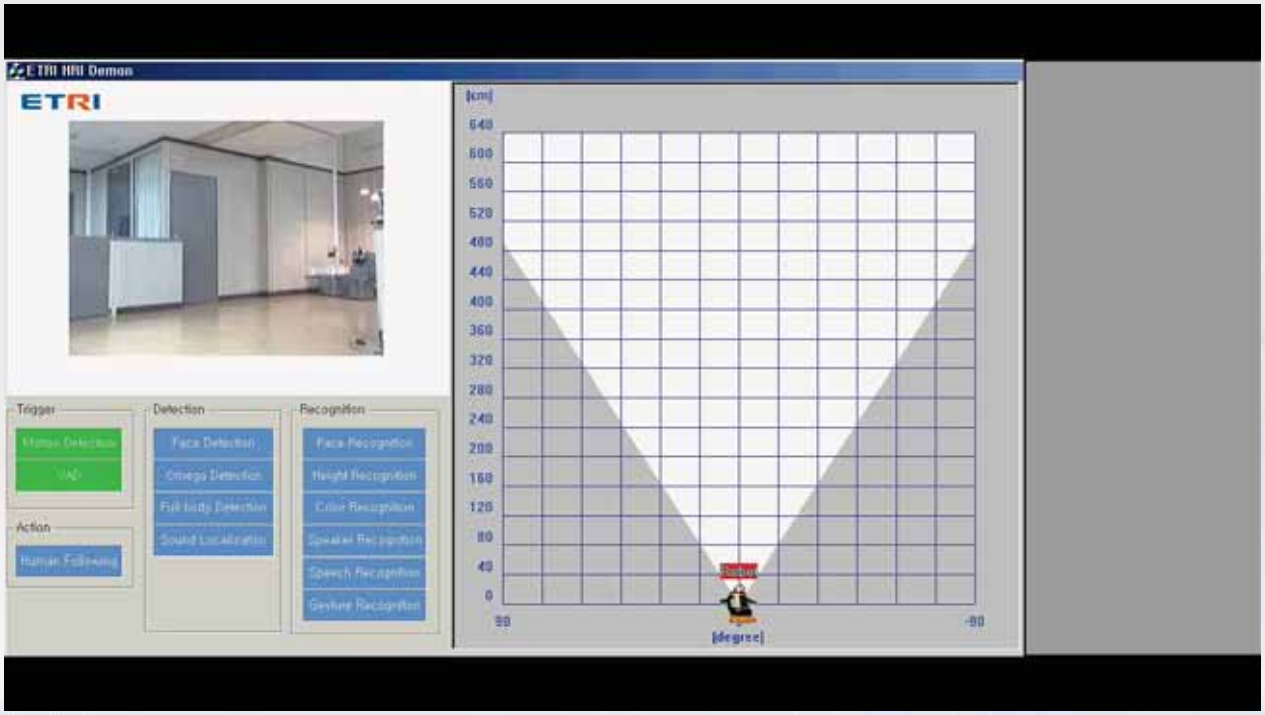
In HRI Demon, Application programmers are far happier

As father returns home, the robot delivers the e-mail arrived an hour ago



HRI Demon

HRI Demon



Then what do we want to standardize?

Events

Event	Arguments
DM_PersonAppeared	Position, Identity of the person if possible
DM_PersonIdentified	Position, Identity of the person
DM_SoundDetected	Direction , Identity, Speech content of the speaker
DM_SpeechRecognized	Position, Identity, Speech content of the speaker
DM_GestureRecognized	Position, Identity, Gesture content of the user
Etc., etc. …	Any information related to user activity

Query & Request

Event	Functionality
QueryPersonHistory	Get interaction history for a specific person
QueryActionHistory	Get a person' s identity that did a specific action
QueryConversationHistory	Get Recent conversation around the robot
QueryDemonCapability	Implementation of various demons may have different capabilities, which can be asked by this function
RequestFollow	Follow a specified person
RequestGoto	Go to a specified position, or to a specified person
Etc., etc. …	

Then what do we want to standardize?

Protocols

HRI Demon is an independent process,
Further it can run on another computer

⇨ Therefore we may need a protocol and data structure definitions for the communication between demon and the application

Analogy to Windows programming

Application program reacts to the messages that windows system sent

```
LRESULT CALLBACK WndProc(HWND hWnd, UINT uMsg, WPARAM wParam, LPARAM lParam)
{
	char temp[80];
	PAINTSTRUCT ps;
	HDC hdc;
	static int count;
	// uMsg : OS로부터 전달받은 Paramater 변수
	switch(uMsg)
	{
	case WM_CREATE:	// Window 생성시 불려지는 Message
		count = 0;
		break;
	case WM_PAINT:	// 출력이 필요한 경우 or 출력을 해도 좋다는 Message
		hdc = BeginPaint(hWnd, &ps);

		strcpy(temp, "Hello world");

		// 아래 코드는 WM_PIAINT가 얼마나 자주 호출되는지 보여주는 코드이다.
		// 최소화, 최대화 시키면 숫자 증가함(WM_PAINT는 여러번 호출!)
		count++;
		sprintf(temp, "Count = %d", count);

		TextOut(hdc, 50, 50, temp, strlen(temp));
		EndPaint(hWnd, &ps);
		break;
	case WM_DESTROY:	// Window 종료시
		PostQuitMessage(0);
		break;
	}
	return DefWindowProc(hWnd, uMsg, wParam, lParam);
}
```

Windows system gathers information about user activity, requests, H/W status, …
→ Then broadcast the message to the application programs

HRI Demon gathers information about the user environments
→ Then send the message to the application programs

Analogy to Windows programming

If Windows defines the following messages	HRI service defines the following messages
WM_MOUSEMOVE	DM_PersonAppeared
WM_CREATEWINDOW	DM_PersonIdentified
WM_LBUTTONCLICK	DM_SoundDetected
WM_PAINT	DM_GestureRecognized

If Windows provides the following APIs	HRI service provides the following APIs
GetClientRect	QueryPersonHistory
GetSysInfo	QueryDemonCapability
CreateWindow	RequestFollow
LineTo	RequestGoto

So What?

Various MS windows compatible OSs are available
Tmax Window
Windows on Mac
MS Windows on X Window

➡ Same application program runs on all of the above

Likewise,

We may have various kinds of demons and healthy competition

- A demon based on audio-visual recognition technologies
- A demon based on USN technologies
- Even we can have a demon depends on user cooperation

➡ Still the same application program runs on all robots

Isn't this the purpose of standardization?

Discussion

I think that the progress in this track has not been so productive

Even though I am a big supporter for the proposed model,
honestly I am not sure it is a perfect model to promote
the adoption of HRI technologies to the robot industry

So, let’ s discuss here and decide whether this is worth trying or not

Thank you for listening

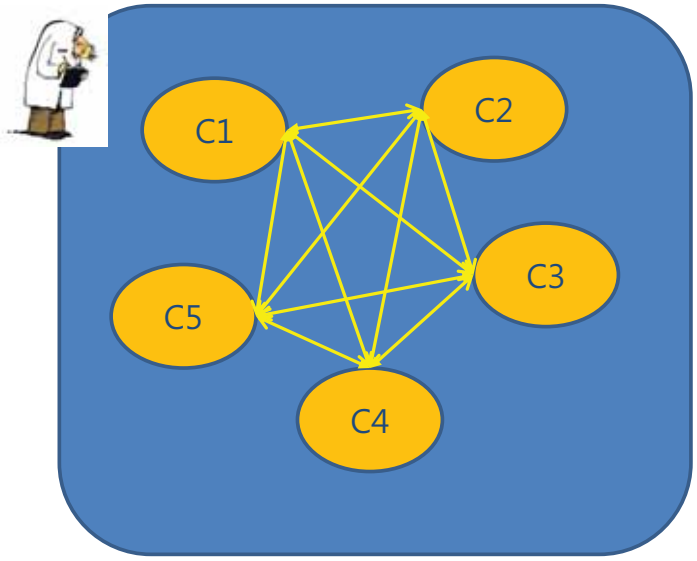
Robotics DTF Function Service WG

Scope of standardization for UIS

Dr. Su Young, Chi,
Dr. Jaeyeon Lee
ETRI
2009-12-08

What we want to do…

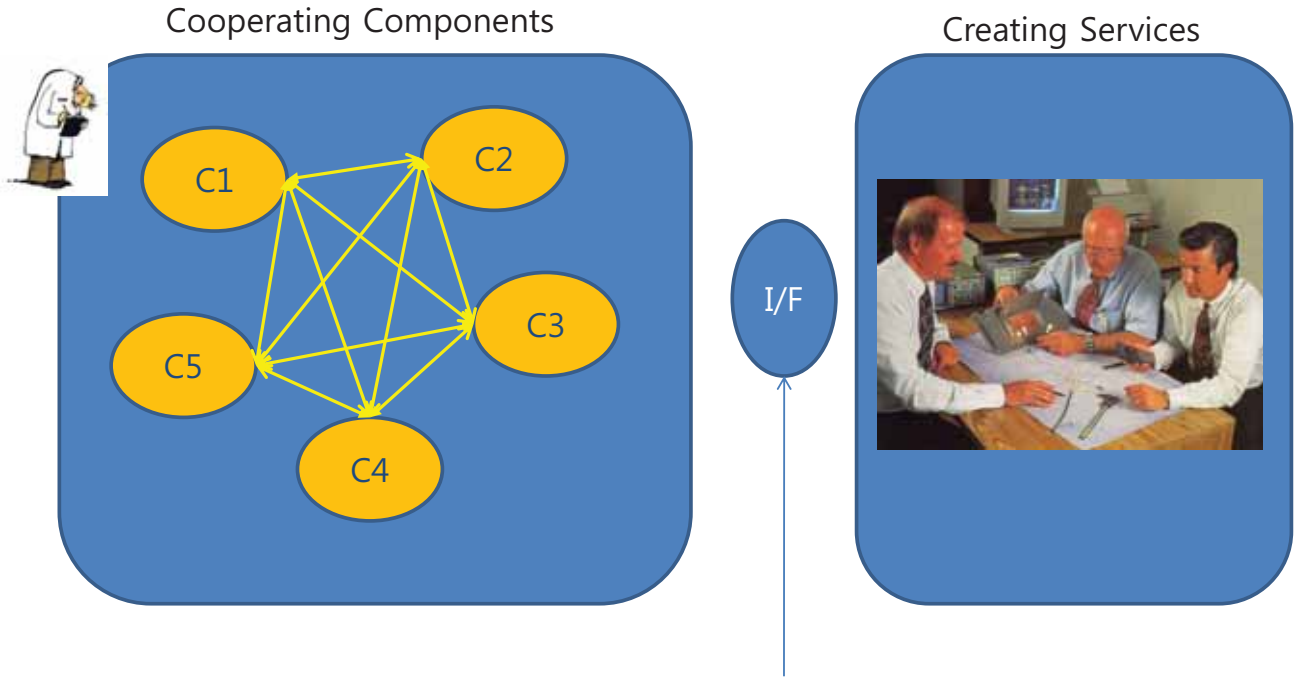
Cooperating Components



Creating Services

Find a way to clearly separate the above two

What we want to do…



Let's define a good interface between them

What we proposed is a way to define events and API to communicate

We want to define…

- the events that interest the application programmer
  "Face detector does not find a face" is a message of no interest
- the events that are feasible in view of state of the art technology
  "To know whether she loves me or not" is an interesting event for the application, but we don't know the technology that enables it
- the events that are related to user interaction
  "TV is turned on" may be an interesting event for the application but is not the scope of this proposal

What kinds of robots are we talking about?

Any robot that needs to understand the people around them

- Manufacturing robot in no man factory is not an issue
- Cleaning robot that runs automatically without intervention of person is not an issue

- Home service robot of a lot of applications is included
- Guide robots in the public place will be included

Isn't the event set different in accordance with the application ?

ABSOLUTELY !!!

However, we also believe that there are common sets

So, how about doing it this way

First step

1. Let's define common sets
2. Let's provide a way to define custom events

Second step

1. Let's define custom events for respective application areas

When a person appearance is recognized, then notify it to the application

Description of Data

WHO

It maybe UNKNOWN if the person is not identified
Otherwise, the following table for user identity

User Identity	Probability
User A	0.8
User B	0.1
User C	0.05
Unknown User	0.095

WHERE

(r, θ) coordinate relative to current robot position,
if it is possible
Only θ if it is all we got (sound source localization)

WHAT

Contents of the speech
Type of user behavior like walked to new location or user gestured something

Application Program Example

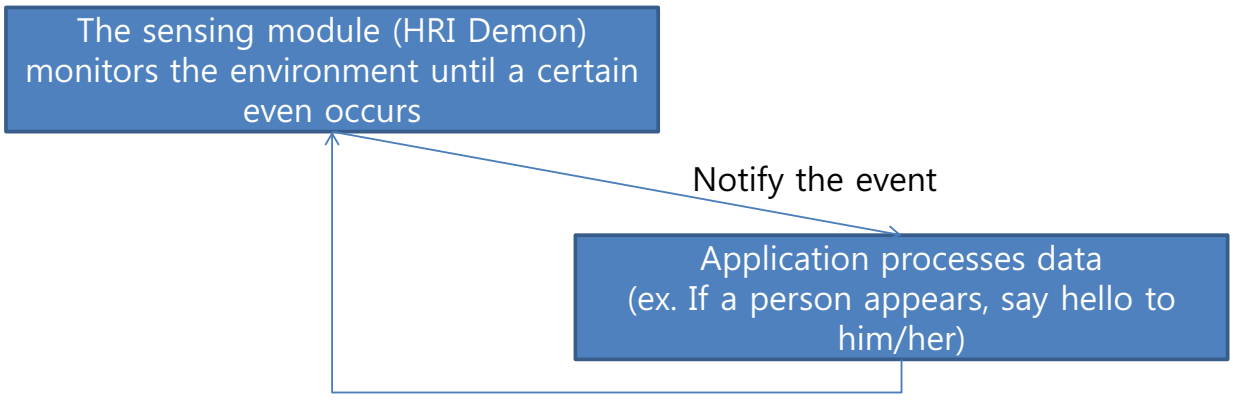
```
Switch (message) {
  Case DM_PERSONAPPEARED:
        App1: Pan head to the user's direction and Say Hello to the person
        App2: Just ignore the event
        break;
  case DM_PERSONIDENTIFIED:
        App1: Search the Service Directory to find out whether there are
          tasks for that user. If the task exists, execute it
        App2: Just Say Hello with the User's name
        break;
  case DM_SPEECHRECOGNIZED:
        App1:  Search for the command directory. If it is a known command,
          then execute the command. Otherwise, the speech recognition
          result may have the meaning in the context (like telling the user's
          name to the robot)
        break;
}
```

Reception Robot Scenario

```
Switch (message) {
  Case DM_PERSONAPPEARED:
        if (r>1m) Ignore it;
        else if (|theta|>45degree) Ignore it;
         else {
            You got it!
            Start Reception scenario…
         }
         break;
  case DM_PERSONIDENTIFIED:
        Just Ignore it…
        or if ((r<2m) && (he is looking at you)) Say Hello
        break;
  case DM_PERSONDISAPPEARED:
        Just Ignore it…
        break;
}
```

You may be able to use message filters if you like…^^

Sequence Diagram



It can notify back to the sensing module that the message was processed. However I doubt that this procedure is Really necessary

How about we think of a specific message that will abide the three conditions I referred…. Any message that is general or specific to a certain application will do

1) The message should interest the application
2) It should be detectable with current technology
3) It is related to the user interaction

After listing up a lot of possible messages and their arguments,
Then we can define a general data structure for the events

DM_PERSONAPPEARED

This message occurs when a new person other than in tracking is detected

- Whereabouts of the person (theta only or radius and theta)
- Identity of the person (unknown is acceptable if it has no knowledge about the person. But if available, user ID table will be presented no matter how the confidence level is low)
- The detector (The person is detected by a sound, vision or some RFID tag, etc…)

DM_PERSONIDENTIFIED

This message occurs when a person is identified with a confidence Larger than a threshold

- Whereabouts of the person (theta only or radius and theta)
- Identity of the person (unknown is NOT acceptable. User ID table that consists of user ID and respective probability will be presented. The largest probability should exceed a certain level)
- The detector (The person is recognized by voice, face, semi-biometrics or RFID tags, etc…)

DM_PERSONMOVE

This message occurs when a person changed its position

- Whereabouts of the person (theta only or radius and theta)
- Identity of the person (unknown is acceptable if it has no knowledge about the person. But if available, user ID table will be presented no matter how the confidence level is low)
- The detector (The person is detected by sound, vision, RFID tag or other sensors)
- What he is doing (walking, running, jumping, waving hands, speaking… etc)

DM_SOUNDDETECTED

This message occurs when a sound is detected

- Whereabouts of the person (theta only or radius and theta if it is matched with other function)
- Identity of the person (unknown is acceptable if it has no knowledge about the person. But if available, user ID table will be presented no matter how the confidence level is low)
- The detector (Obviously its detected by the sound, however it still can have the track information of vision of RFID tag also)

DM_SPEECHRECOGNIZED

This content of the user speaking is recognized

- Whereabouts of the person (theta only or radius and theta if it is matched with other function)
- Identity of the person (unknown is acceptable if it has no knowledge about the person. But if available, user ID table will be presented no matter how the confidence level is low)
- The detector (Obviously its detected by the sound, however it still can have the track information of vision of RFID tag also)
- Contents of the speaking

Introduction to DDS

Robotics DTF – Long Beach, CA – Dec., 2009

Rick Warren, RTI

rick.warren@rti.com

document number: robotics/2009-12-13

Introduction

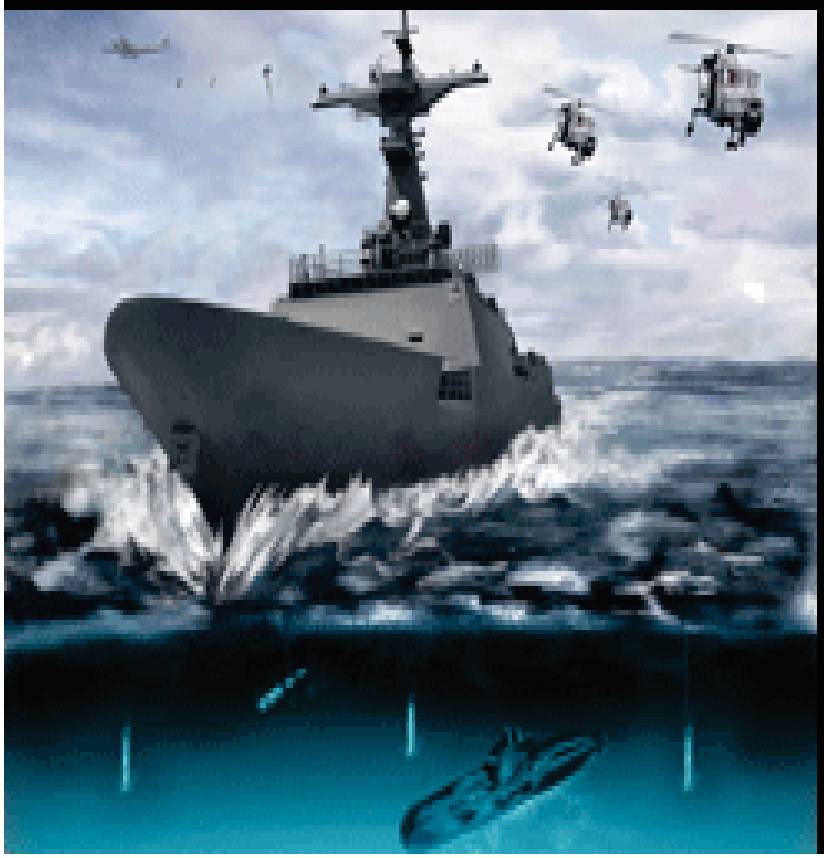
- Rick Warren
- Principal Engineer, RTI
- rick.warren@rti.com

- Background in:
  - Real-time communication
  - Robotics software, including RTC with AIST

What is DDS?

1. **Data Distribution Service for Real-Time Systems**
   - API for publish-subscribe communication
   - Determinism, configuration for real-time applications
   - Lightweight architecture for embedded systems
   - OMG specification since 2003
   - 9+ implementations: commercial, open source, internal
2. **Real-Time Publish-Subscribe (RTPS) Protocol**
   - Interoperability protocol for DDS implementations
   - OMG specification since 2006 (RTPS 2.x, also "DDSI")
   - Based on earlier IEC specification (RTPS 1.x)
   - 4+ implementations
   - ***No other pub-sub system has this*** *(JMS, CORBA NS, …)*

Some People Think DDS is Like This



FFX-1 Naval Combat System

- South Korean military upgrading frigate ship fleet
- RTI working with Samsung Thales
- Need automated computer functions with minimal personnel
  - Target detection
  - Tracking
  - Real-time control

Volkswagen: Driver Safety System

Research: integrate…

- Vision system for sensing environment
- Obstacle avoidance
- Driver information
- Other functions

Requirements:

- High throughput for rich media
- Low latency for real-time response
- Deterministic behavior

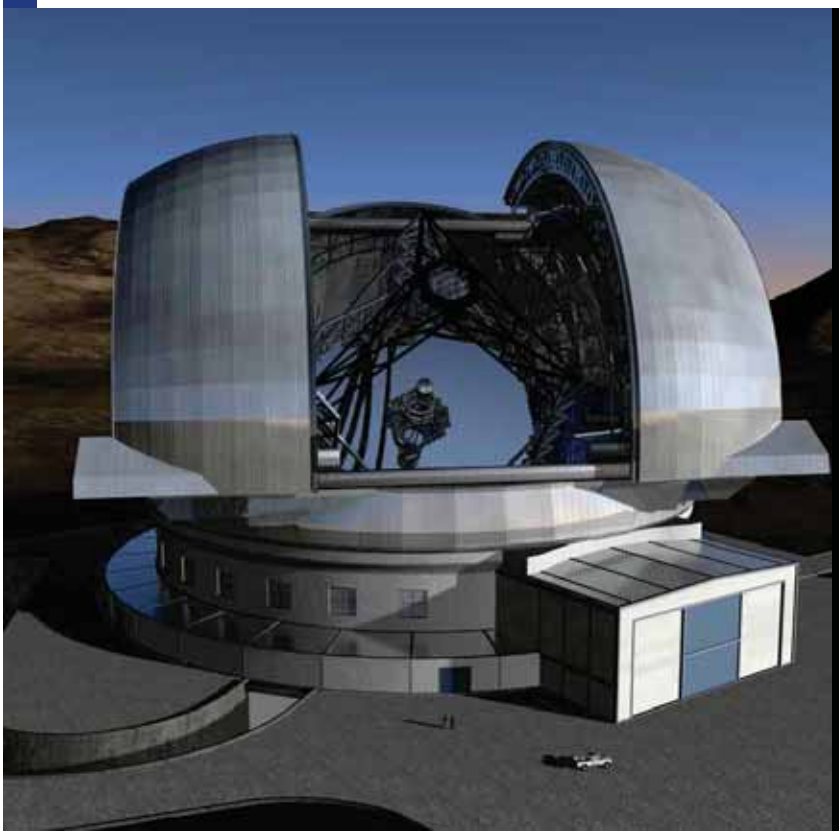
Network:

- Legacy: CANbus
- High-bandwidth network: Ethernet
- *Need to abstract network transport*

Wi-tronix: Mobile Asset Tracking

- **System used to wirelessly monitor high-value mobile assets, such as:**
  - **Trains**
  - **Ships**
  - **Industrial equipment**
- **Biggest challenge was wireless bandwidth issues**
- **RTI addressed critical issues such as tuneability and discovery process over wireless network**

European Southern Observatory



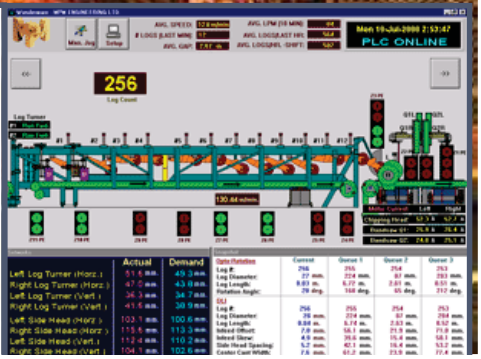
- Hundreds of small telescopes
- Combined to create one large image
- Detects atmospheric disturbance to calibrate mirror positions in real time
- Uses RTI's DDS in real-time control loop
- Integrates control logic in LabView

Varian: MRI and NMR Medical Imaging

"RTI delivered great functionality at a low cost. Using RTI middleware saved us a lot of money, time, and effort compared to our previous in-house developed solution."

- Varian provides leading edge tools and solutions for diverse, high growth applications in the life science industry
- Needed new software architecture to seamlessly handle its expanding product line of magnetic instruments
- RTI provided the flexible and powerful QoS needed. Using RTI greatly simplified system integration & connection
- Varian is today shipping RTI DDS middleware in entire NMR instruments product line.

Schneider Programmable Logic Controllers



- Modern factories require the exchange of up-to-the-minute data on manufacturing processes, even with resource-constrained devices
- Challenge to incorporate devices with limited memory or processing power
- RTI with Schneider created a compact real-time publish-subscribe service – resides & executes in under 100 kb!

Shapes Demo

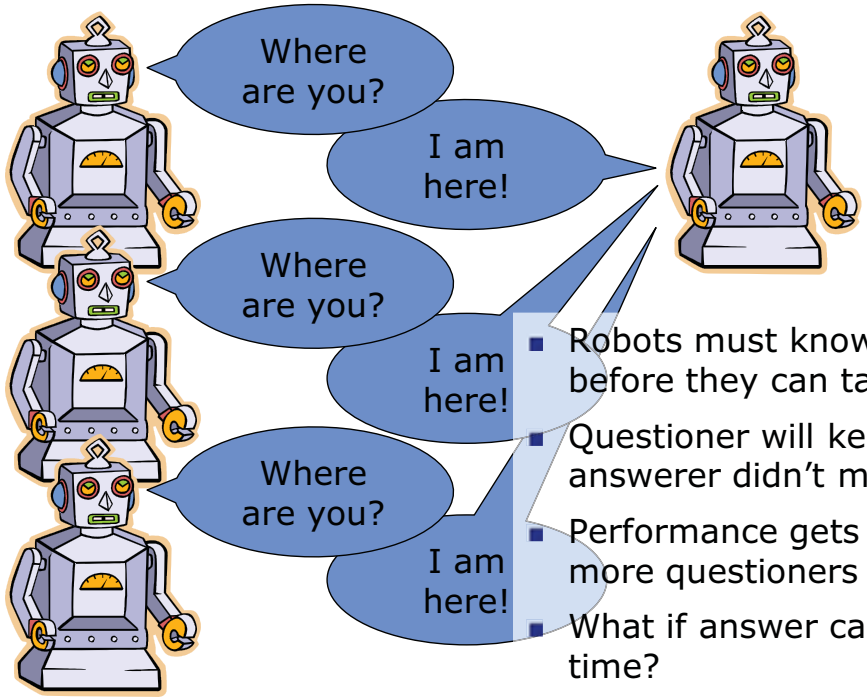
(Download this demo from www.rti.com)

Why Use DDS?

- Easy to develop, easy to integrate
  - Publish-subscribe pattern simplifies design, decreases dependencies
  - Rich functionality means less work to do
  - Platform independence gives you flexibility
- Fast, real-time performance
  - Performance as good as the network can provide
  - Low latency: get critical data on time
  - High determinism: low jitter for stable algorithms
  - Built-in reliable multicast for one-to-many scalability
  - Get notified right away of missed deadlines, connectivity loss, etc.

Publish-Subscribe vs. Client-Server

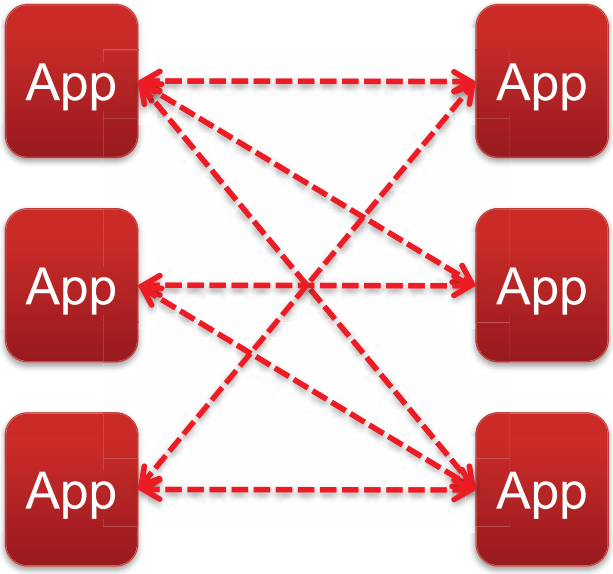
- Client-server, like CORBA:



- Robots must know "who's who" before they can talk
- Questioner will keep asking, even if answerer didn't move
- Performance gets much worse with more questioners
- What if answer can't respond in time?

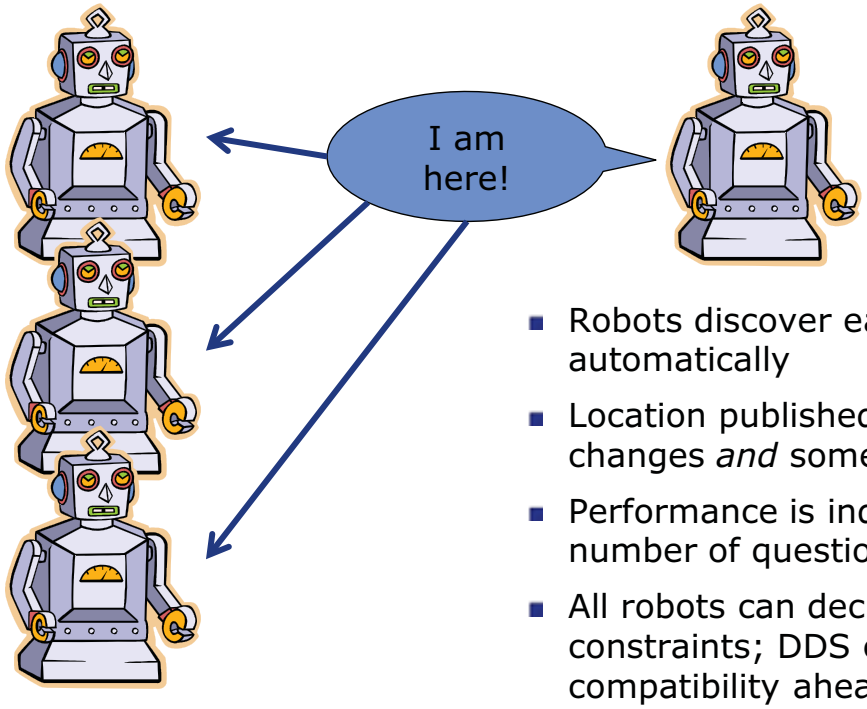
Client-Server Topology

- Many connections to keep track of
- Changes have side effects, break easily
- Performance doesn't scale



Publish-Subscribe vs. Client-Server

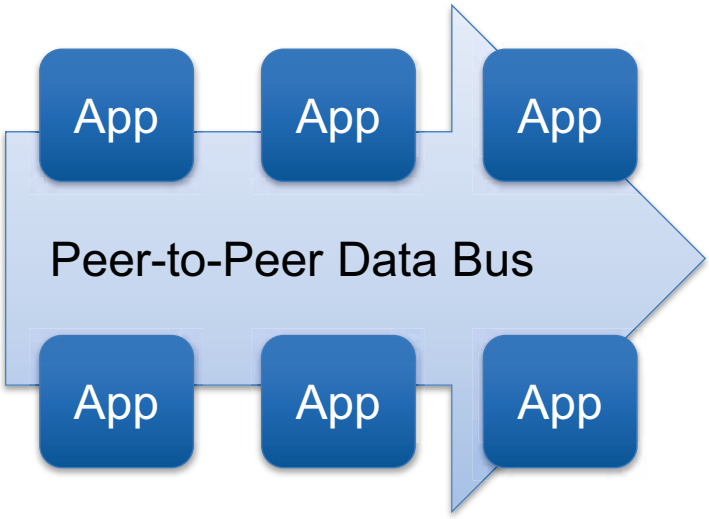
- Publish-subscribe, like DDS:



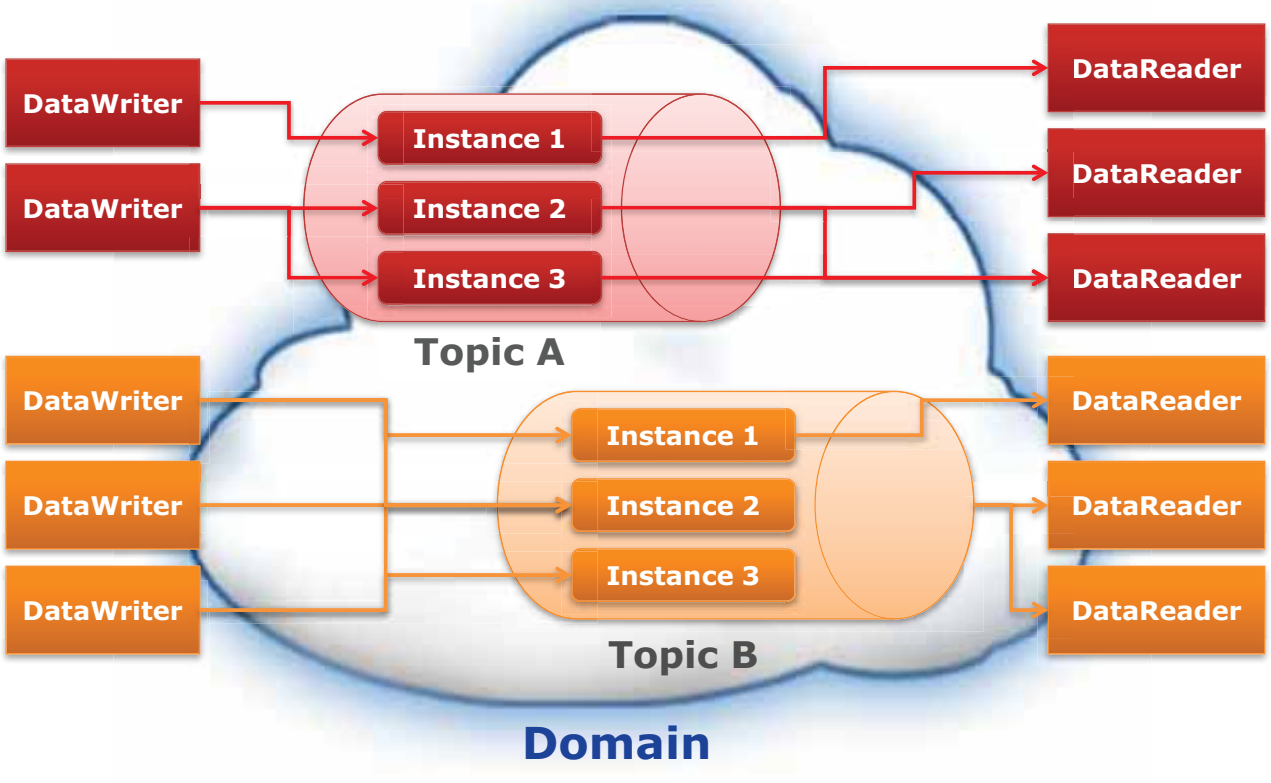
- Robots discover each other automatically
- Location published only when it changes *and* someone is listening
- Performance is independent of number of questioners
- All robots can declare performance constraints; DDS checks compatibility ahead of time

Publish-Subscribe Topology

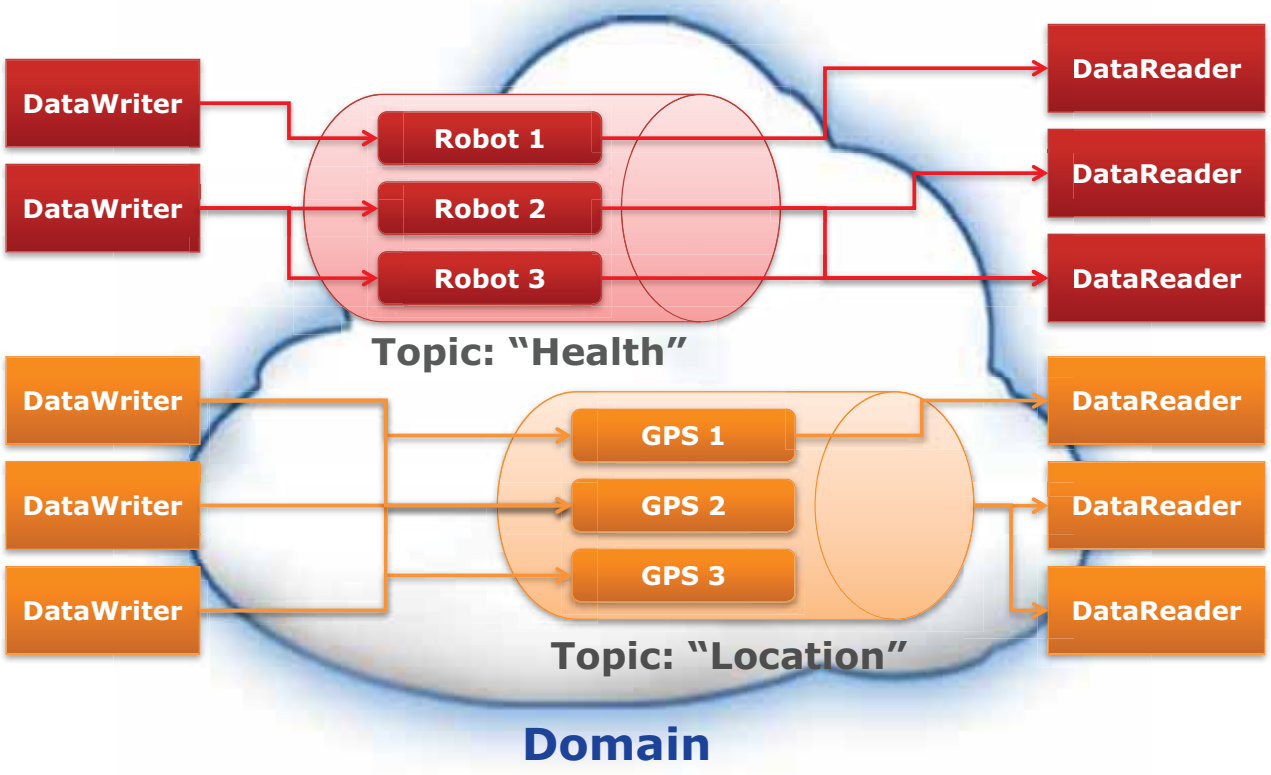
- Simple to understand
- Flexible and fault tolerant
- Performance scales as your system grows



DDS Communication Model



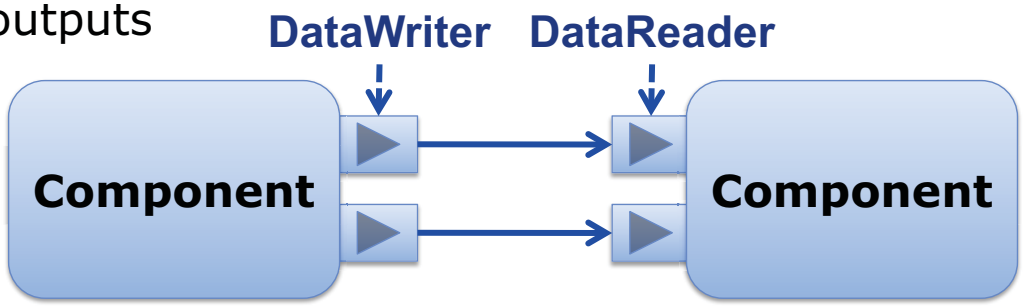
DDS Communication Model



Works Well With Component Software

- How do you **describe** a **component**?
  - **Inputs**: what it requires
  - **Outputs**: what it produces
- Create system by connecting inputs to outputs

- **DDS is like this too**
  - **Inputs** == *DataReaders*
  - **Outputs** == *DataWriters*



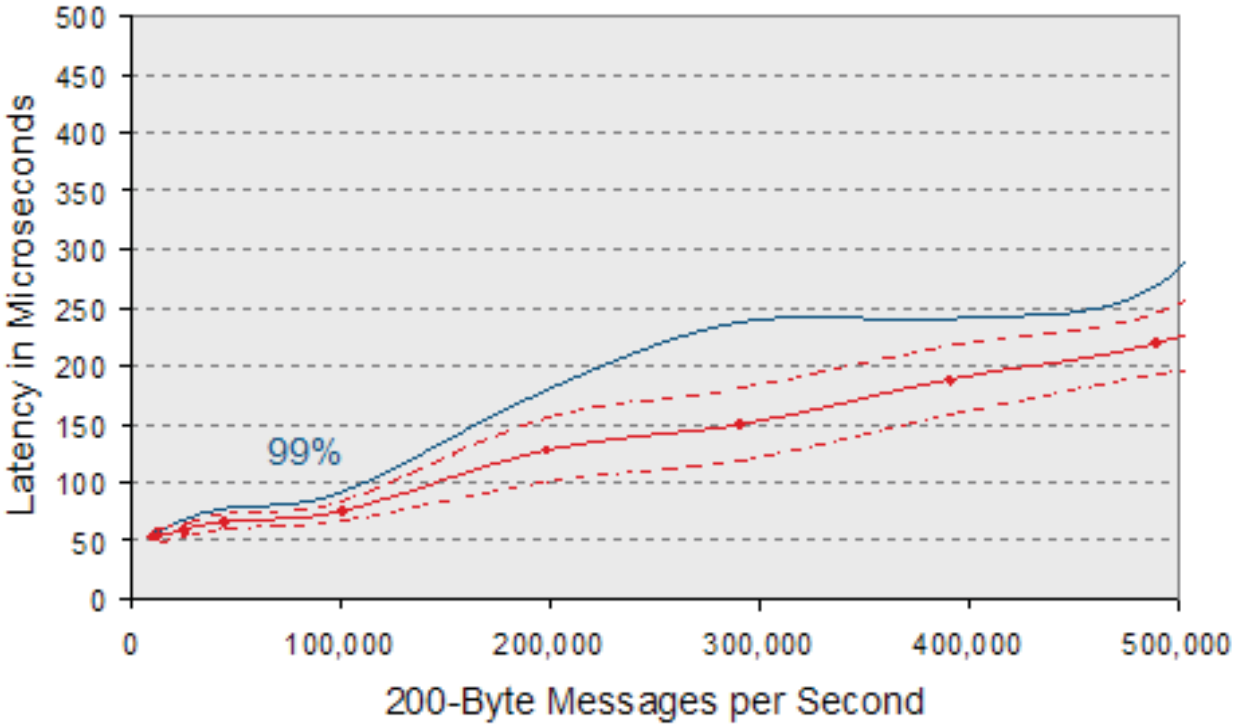
Rich Functionality Built In

- **Other middleware says**: "Subscribe to my topic. I might send you a message some time."
  - What data will you send me?
  - How often?
  - What happens if you don't send it?
  - What happens if I don't receive it?
  - **Answer**: *You must implement these yourself.*
- **DDS topics** have a **data type**
  - Publishers and subscribers must agree
  - Not the same? Notification!
  - Built-in content-based filtering
- **DDS topics** have quality-of-service (**QoS**) config
  - How often data will be delivered
  - How reliable it will be
  - Publisher must offer >= subscriber's request. Otherwise, notification!
  - Notifications on missed deadlines, lost data, lost connection, etc.

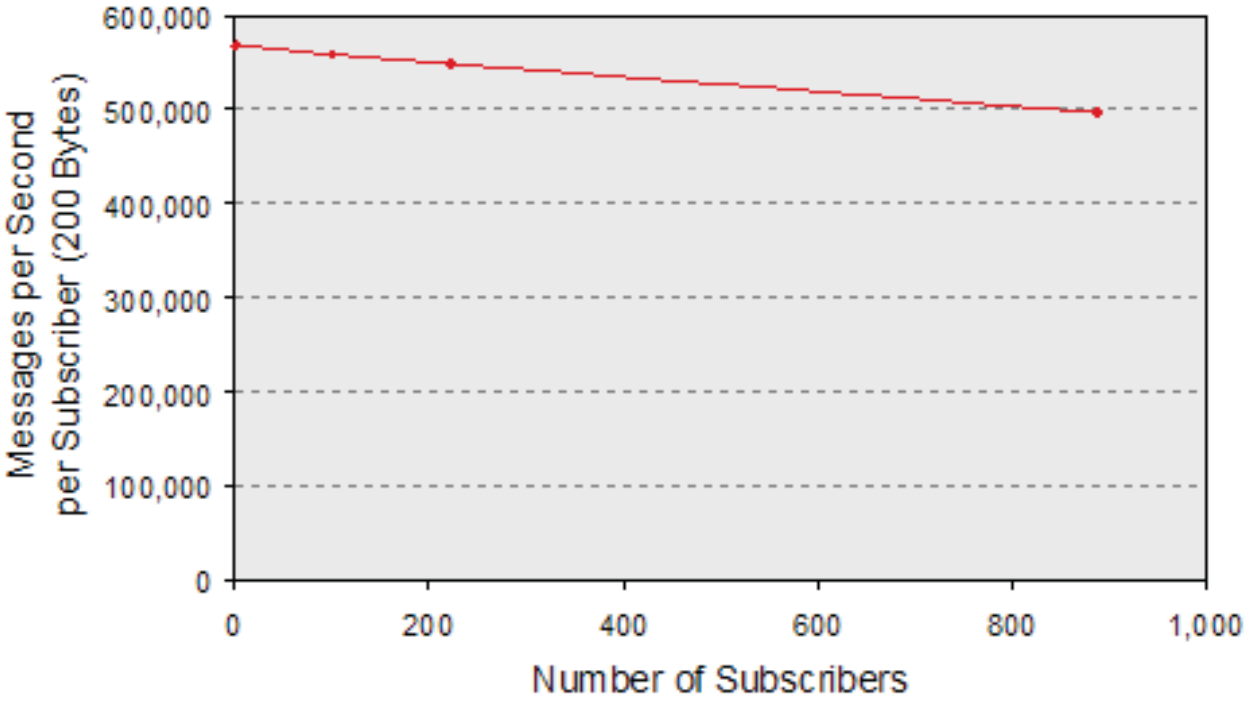
Platform Independent

- *OS*: Windows, Linux, real-time/embedded (for example, VxWorks), other…
- *Language*: C, C++, C#, Java
- *Network*: IPv4, IPv6; unicast, multicast; shared memory; Infiniband, …
- *Middleware implementation*: multiple can interoperate

Low Deterministic Latency



Performance Scales as System Grows



Conclusion

- DDS is a widely adopted, mature standard
- DDS is easy to use, easy to integrate
  - Rich functionality built in
  - Interoperable across platforms, across implementations
  - No servers to administer
- DDS is applicable to a wide range of real-time applications
  - Low resource usage
  - Deterministic behavior
  - Built-in deadline enforcement
- DDS is fast, even in large systems

Resources

- **Learn more** on the OMG DDS Portal: http://www.omgwiki.org/ddsportal/
  - Specifications
  - Presentations
  - Blogs, videos
- **Try the software**:
  - Download no-cost evaluation of RTI's implementation from www.rti.com
  - Other implementations listed @ http://portals.omg.org/dds/VendorsPage
- **Get involved**:
  - Join DDS mailing list, dds@omg.org
  - Come to MARS meetings

Robotics-DTF Plenary Meeting
Opening Session

December 9th, 2009

Long Beach, CA, USA

Hyatt Regency Long Beach

Approval of Minutes

Meeting Quorum : 4

AIST, ETRI, JARA, KAR, RTI, Technologic Arts, View Five, Univ. of Tsukuba,

Minutes taker(s): **Geoffrey Biggs**

Minutes review **Rockwon Kim**

San Antonio Meeting Summary

Robotics Plenary: (15 participants)

- 2 New Work Item Discussion
  - RTC Deployment and Dynamic Reconfiguration RFP
  - User Identification Service RFP
- 2 WG Reports [robotics/2009-09-12, -15]
- 1 Contact Reports [robotics/2009-09-17]
- Preliminary agenda for upcoming meeting [robotics/2009-09-19]

Agenda Review

14:00-14:10 Opening Session
14:10-15:00 Special Talk
15:00-15:30 Contact Reports

16:00-17:00 Joint Plenary with MARS
1st Review of DDR RFP draft

17:00-17:40 WG Reports and Roadmap Discussion
17:40-17:50 Wrap-up Session
17:50 Adjourn

please check our up-to-date agenda
http://staff.aist.go.jp/t.kotoku/omg/RoboticsAgenda.pdf

Introduction of ISO/IEC JTC1/SC24

December 9, 2009

Yun Koo Chung
ETRI

JTC 1

- **JTC 1:** Joint Technical Committee of IEC and ISO (January, 1987).
- **Title of JTC 1 : "Information Technology"**
- **Scope** : "international standardization in the field of **information technology".**

- **Information Technology includes**
  the specification, design and development of systems and tools dealing with the capture, representation, processing, security, transfer, interchange, presentation, management, organization, storage and retrieval of information**.**

JTC1 /SC24

- **Title of JTC 1/ SC 24 : Computer graphics, image processing and environmental data representation**
- **Scope:** Standardization of interfaces for information technology based applications relating to:
  - **computer graphics, (WG6)**
  - **image processing, (WG7)**
  - **virtual reality, (WG6)**
  - **environmental data representation and (WG8)**
  - **interaction with, and visual presentation of, information**

- **Included** are the following related areas: Modelling and simulation, related reference models; application program interfaces; functional specifications; representation models; interchange formats, encodings and their specifications, including metafiles; device interfaces; testing methods; registration procedures; presentation and support for creation of multimedia and hypermedia documents.

- **Excluded:** Character and image coding; coding of multimedia and hypermedia document interchange formats, JTC 1 work in user system interfaces and document presentation; ISO TC 207 work on ISO14000 environment management, ISO TC211 work on geographic information and geomatics; and software environments as described by ISO/IEC JTC 1 SC22.

Standard Specs developed by SC24

- Graphical Kernel System
- GKS Language Bindings
- PHIGS
- PHIGS Language Bindings
- Interface Techniques for Dialogues with Graphical Devices (CGI)
- Conformance Testing
- Reference Model
- Image Processing and Interchange (IPI)
- Presentation Environment for Multimedia Objects (PREMO)

WG 6: Computer Graphics

- In co-operation with the Web3D Consortium, several eXtensible 3D (X3D) projects have been advanced as transposed standards.

- Edition 1 of Part 1 of the 19775 X3D standard has advanced to FDIS.
- Several other potential projects are anticipated for New Work Proposals over this annual cycle in alignment with the Web3D Consortium work plan

WG 7: Image Processing

- In direct co-operation with ISO TC 211, standards dealing with metadata are being developed. These are significant to the contribution of multi-consortia metadata harmonization and crosswalks and include the following TC 211 imagery content standards;
  - ISO 19115-Part 2 – Metadata for imagery and gridded data
  - ISO 19118-Part 2 – Encoding rules for imagery and gridded data;
  - ISO 19130 Geographic information – Imagery sensor models for geo-positioning;

- **The North Atlantic Treaty Organization (NATO) Joint Intelligence, Surveillance and Reconnaissance (ISR) Capability Group (JISRCG)** : is a primary user of the WG7 standards
- and employs them in data capture and exchange systems, generating interoperability architectures that can be adopted or adapted to other user applications. The ongoing relationship between SC24, TC211 and JISRCG serves to provide expert assistance and to assure the application of interoperable standards as a result of this three-way relationship.

WG 7: Image Processing

- **Additional topics that are of interest to SC 24/WG 7 as co-operative efforts include:**
  - Development of standards that support data **from spectral, optical, radar, laser, polarimetric and other advanced remote sensor**s that can be portrayed and fused with imagery.
  - **Application of satellite imagery and remotely sensed data,**
  - Application of remote sensing in non-stationary platforms such as Unmanned Aeronautical Vehicles (UAVs), hand-held devices such as mobile phones and digital cameras
  - Application of image processing for **home, social life, and industry, such as home security systems, intelligent robots, automated inspection systems and autonomous navigation systems.**
  - **Co-operate with JTC 1/ SC 29.** Work within this SC 24 reporting period includes incorporation of implementation of SC 29 JPEG 2000 standards used inside the BIIF standard.;.

WG7 Standards

- ISO/IEC 12087 -1: 1995(E)
  Common architecture for imaging
- ISO/IEC 12087-2: 1994(E)
  Programmer's imaging kernel system application program interface (PIKS API)
- ISO/IEC 12087 -3: 1995(E)
  Image interchange facility (IIF)
- ISO/IEC 12088-4: 1995(E)
  Application program interface language binding C
- ISO/IEC 12087-5: 1998(E)
  Basic Image Interchange Format (BIIF)
- ISO/IEC 9973: 1994(E)
  Procedures for registration of graphical items

WG 8: Environmental Representation

- In co-operation with the SEDRIS Organization and in liaison with ISO TC 211, the International Hydrographic Office (IHO), and the Defence Geospatial Information Working Group (DGIWG), the standards relating to SEDRIS technology have been developed and published.
- ISO/IEC 18023 parts 1, 2 and 3 address the representation and interchange of environmental data. ISO/IEC 18025: **Environmental Data Coding Specification** (EDCS) and ISO/IEC 18026: **Spatial Reference Model (SRM)** are used to provide unambiguous ways in which to **specify environmental features, their attributes, their locations and related data.**
- SEDRIS standards, either as a whole or as independent components, may be applied to work in other areas such, as in WG 6, and in committees and organizations external to SC 24.
- SC 24 liaisons with the NATO Modelling and Simulation Group, the Simulation Interoperability Standards Organization (SISO) and the Defence Geospatial Information Working Group (DGIWG) to support the use of the SEDRIS standards by these organizations.

Liaisonship to OMG

- **Recommendations of ISO/IEC JTC1 SC 24 / WG 7** (WG7 meeting held at London,UK 07-08-2009 , docu: ISO/IEC JTC1 SC24N3131)
  - Yun Koo Chung was appointed as a liaison to OMG Robotics DTF for the Image processing standards for intelligent robots
- **Resolutions of ISO/IEC/JTC 1/SC 24 (docu:** ISO/IEC JTC1 SC24N**3182)**
  - SC24 appointed Yun Koo Chung as a liaison to OMG Robotics DTF for the Image processing standards for intelligent robots
- I want to request Robotics DTF to appoint me as a liaison to JTC1/SC24 for standardization of imaging based application for service robots.
- Discussion with ISO/TC184/SC2 WG7 Convenor:
  - Joint work for standardization of image processing specifications for intelligent service robots

RTC Deployment and Dynamic Reconfiguration (DDR) 1st draft

document number: mars/2009-12-15
robotics/2009-12-16

Noriaki Ando
Infrastructure WG, Robotics DTF
National Institute of Advanced Industrial Science and Technology

Purpose of Infra. WG

- The purpose of the Infrastructure Working Group of the Robotics Domain Task Force is *to standardize fundamental models, common facilities, and middleware to support the development and integration of a broad range of robotics applications*.

OMG RTC Specification

- Robotic Technology Component (RTC): RTC's component model provides typical functionality and services for robotic systems
  - "Robotic Technology Component Specification" [formal/2008-04-04]
- Implementations:
  - AIST: OpenRTM-aist (C++, Java, Python)
  - SEC: OpenRTM.NET (C#, VB, etc)
  - Korean National Project "OPRoS": partially complient with OMG RTC specification

Users of RTC Specification

- OpenRT Platform Project (Japan)
  - 15 consortium, more than 40 research institutes, universities and companies
  - Two missions
    - Software platform for robotic system development
    - Software component library development for service robots
- OPRoS (Open Platform for Robot Services) Project (Korea)
  - More than 25 research institutes, universities and companies
  - Software platform for robotic system development

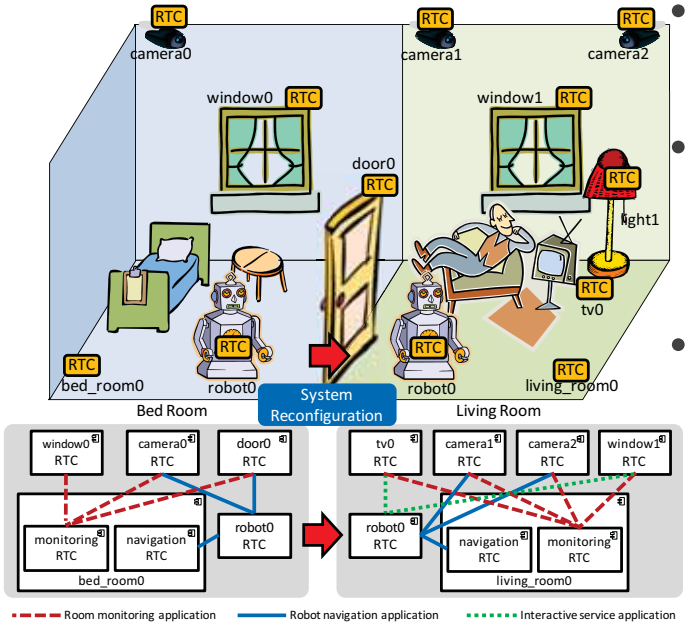
RTC Deployment and Dynamic Reconfiguration (DDR)

Motivation

- Common component repository service for RTC
  - Registering, storing, searching and downloading component
- Common component deployment interface for RTC
  - Deploying RTC on the distributed nodes
  - Configuration, making connection among RTCs
- Common directory services for RTC instances
  - Registering, searching component
- Common method for detection and a notice of change of a component
  - Notifying changing event into other RTC-based systems
  - Runtime reconfiguration based on changing event

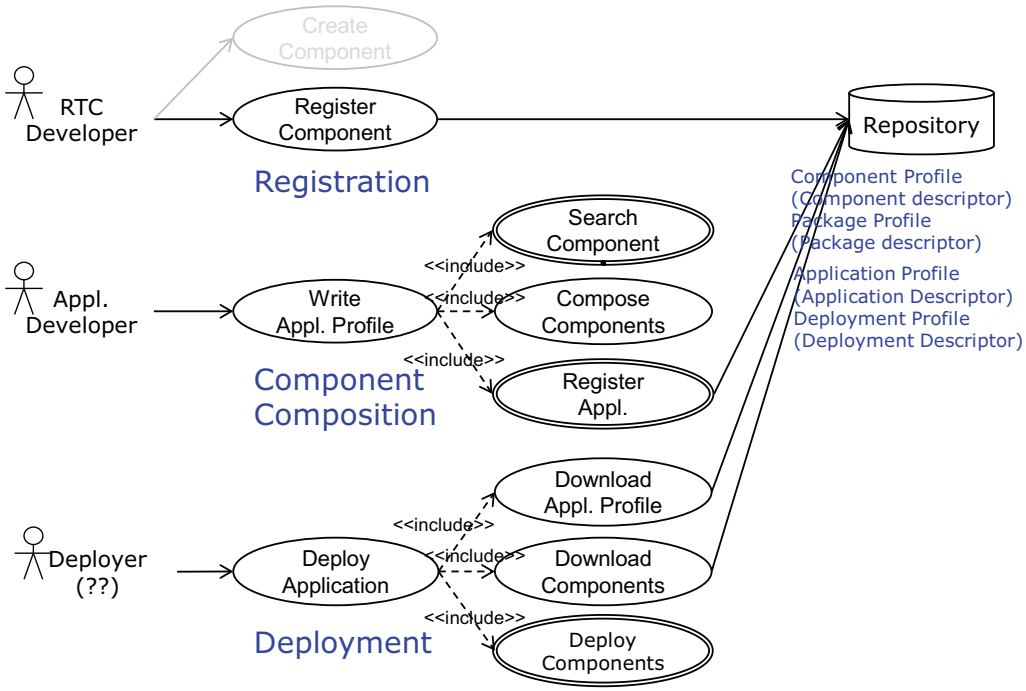
New specification defining these functionality is necessary

Assumption

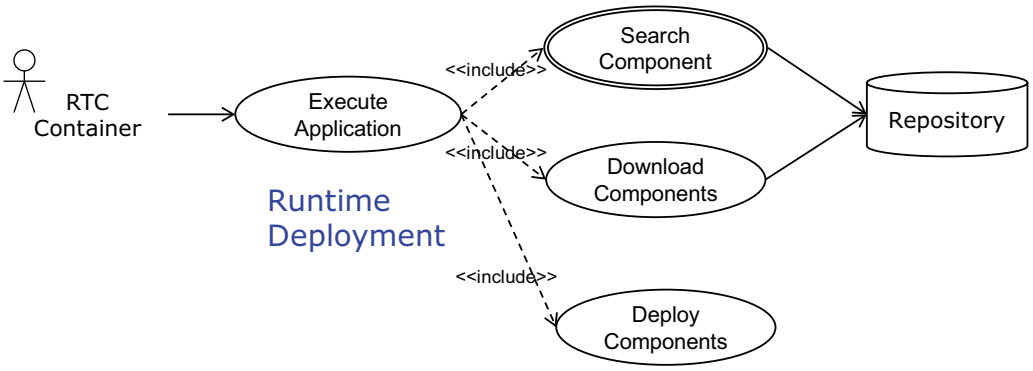


- Many RTCs are distributed spatially
- Systems would be constructed as RTCs aggregation
- System structure should be changed according to the environmental changes in run-time

Use case (1): Deployment

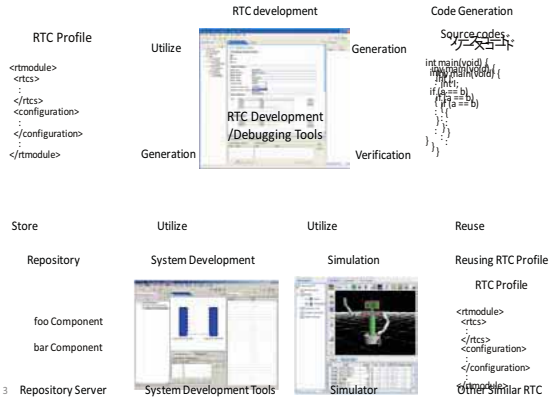


Use case (2): Deployment



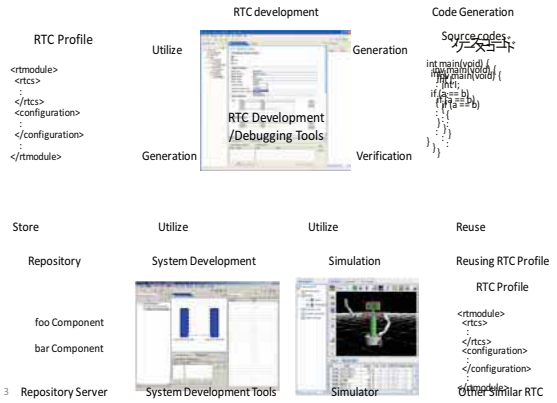
RT component profile

- Meta data structure that describe component profile
- Various usage
  - Code template generation
  - Repository database information
  - System development
  - Simulation
  - Re-use



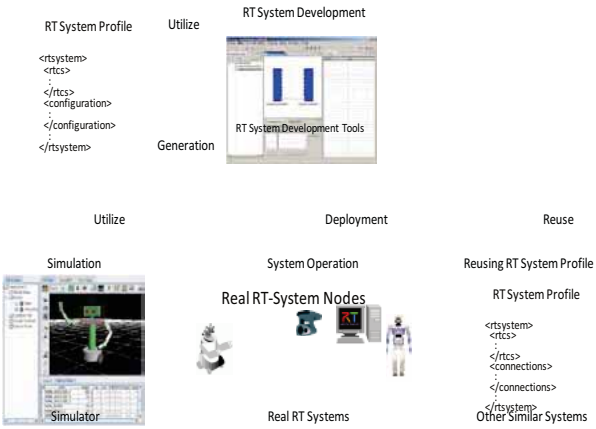
Repository Interfaces

- RTC source/binary data base
  - Registered by RTC developer
  - Searched/downloaded at system deployment time
- RTC-based system profile data base
  - Registered by system developer
  - Searched/downloaded at system deployment time



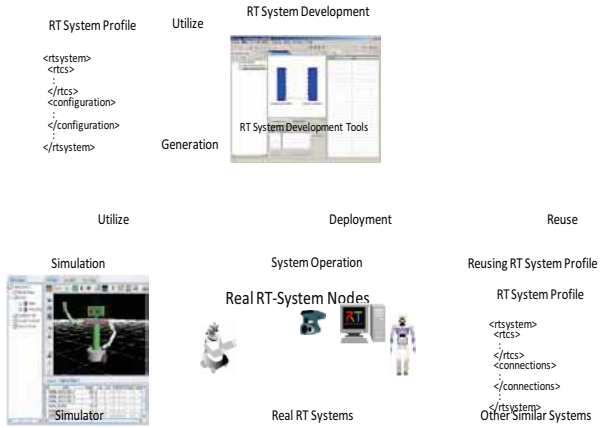
RTC-based system deployment profile

- Meta data structure that describe system structure
- Various usage
  - System design tools' data format
  - System deployment
  - Simulation
  - Re-use

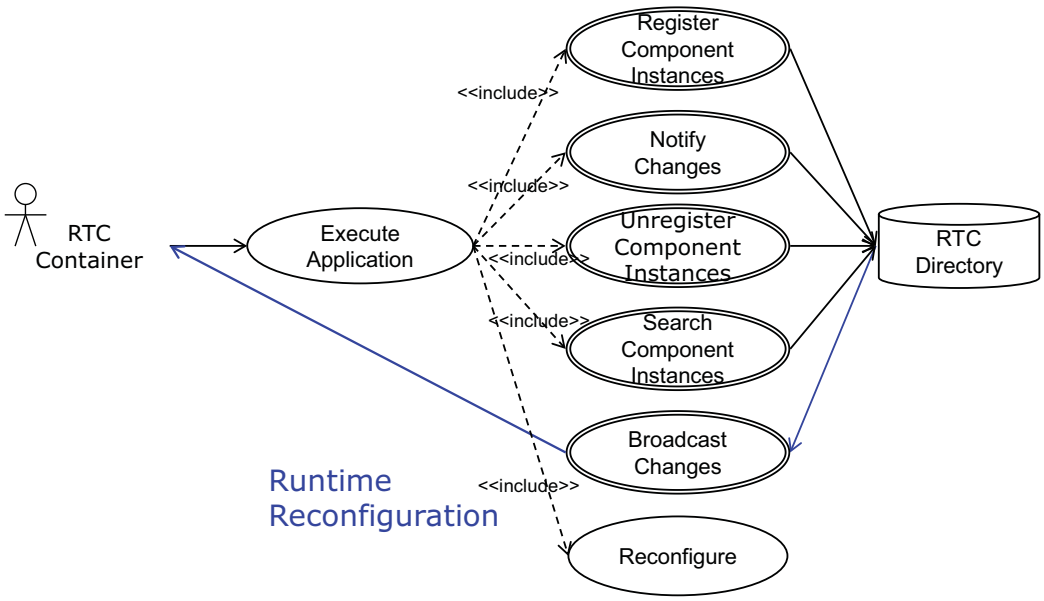


RTC-based system deployment interface

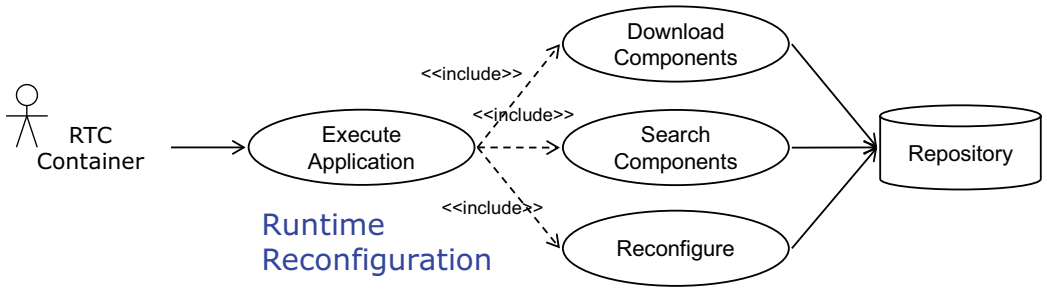
- Interfaces for RTC-based system deployment
  - It would be provided by distributed nodes
  - It manages component lifecycle including downloading, loading, creating and destroying
  - It would be used by application programs



Use case (1): Reconfiguration



Use case (1): Reconfiguratrion



RTC instance lookup

- Naming service, directory service
- It provides higher level search functionality based on component profile information

RTC instance tracking

- Tracking component internal status
- Tracking component internal parameters

Mandatory Requirements

- Interfaces for storing, searching and retrieving RTCs with RTC profiles
- Interfaces for storing, searching and retrieving RTC-based systems and its profile.
- Interface for RTC deployment into the nodes and the deployment profile.
- Interfaces for RTC registration, searching, discovery and notification of environmental changes.

Expected specification

- Certain types of profile descriptions
  - UML PIM and XML schema PSM or IDL PSM etc.
- Certain types of interfaces
  - UML PIM and IDL PSM etc.

Modification

"Objective of this RFP "

- Descriptions specific to robotics for the deployment of RT components.
- Interfaces for deploying RT components into robotic systems at runtime.
- Methods and interfaces for notifying the relevant RT component instances of environment changes.
- Common methods and interfaces for searching for appropriate RT component instances and dynamically reconfiguring them.

- Methods and interfaces for searching for appropriate RT component instances and dynamically reconfiguring them.

Term Consolidation

- RT systems
- Robotic systems
- RTC based systems
  - → RTC-based systems

- Robot application
- RT component-based application
  - → RTC-based application

- RTC based application profiles
  - → RTC-based system profile

Grossary

- Robot application
  - A software application that controls a robot's behavior. Examples include a vacuum cleaning robot and a butler robot.
- RTC-based system
  - A system comprised of RTCs connected in a network representing a robotic system, including robot hardware and software algorithms.
- RT-component profile
  - A description that represents the static state of an RT
- RTC-based system profile
  - A description of how RT-components are connected and interact with each other, and RT-component configuration parameters.

Schedule

Event or Activity	Actual Date
Preparation of RFP by TF	
RFP placed on OMG document server	*February 22nd, 2010*
Approval of RFP by Architecture Board *Review by TC*	*March, 2010*
TC votes to issue RFP	*March, 2010*
LOI to submit to RFP due	*June, 2010*
Initial Submissions due and placed on OMG document server ("Four week rule")	*August 23rd, 2010*
Voter registration closes	*September, 2010*
Initial Submission presentations	*September, 2010*
Preliminary evaluation by TF	
Revised Submissions due and placed on OMG document server ("Four week rule")	*February 21st, 2011*
Revised Submission presentations	*March, 2011*
Final evaluation and selection by TF *Recommendation to AB and TC*	
Approval by Architecture Board *Review by TC*	
TC votes to recommend specification	*March, 2011*
BoD votes to adopt specification	*June, 2011*

AIST RT MIDDLEWARE

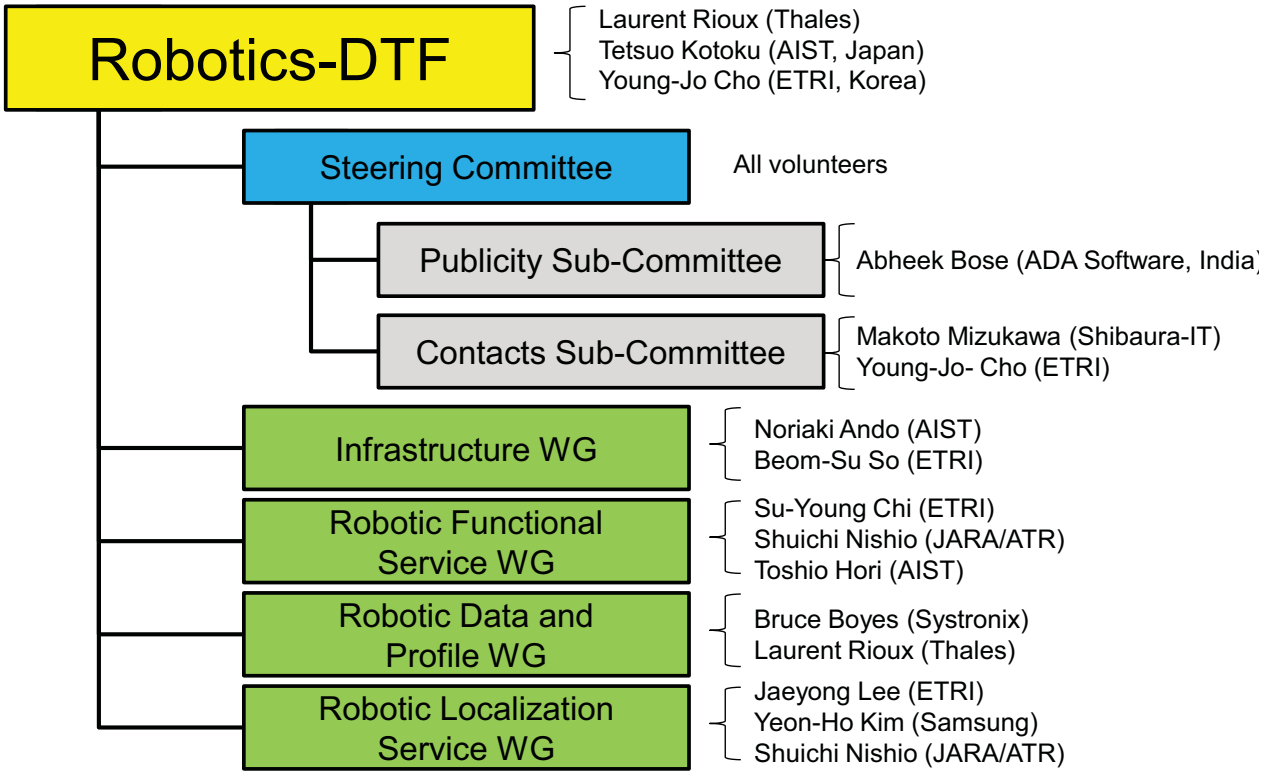
Other Related Technology

- Target
  - Directory service, discovery service
  - Deployment and configuration
- OMG related specification
  - CCM (Deployment and Configuration)
  - Software radio
  - MARTE
- Other specification
  - Web service
  - Ice Box
  - OSGi
  - EJB
- What is necessary for to realize our use case

Schedule

- Make a 1st draft (9/23)
- Review it with ETRI and AIST (9/30)
- Distributed and gather opinions from all infrastructure members
- Make a 2nd draft (11/9, 4 weeks before)
- 1st review at Long Beach (submit 1 month before)
- Review a draft
- Make a final draft
- 2nd review at Jacksonville
- Propose it to AB

Robotics DTF



Contact Report: Status of Robotic Localization Service(RLS) in ISO/TC211

2009.12.09

ATR Intelligent Robotics and Communication Laboratories
NISHIO Shuichi (nishio@ieee.org)

ISO/TC211: Geographic Information / Geomatics

Scope

Standardization in the field of digital geographic information.
This work aims to establish a structured set of standards for information concerning objects or phenomena that are directly or indirectly associated with a location relative to the Earth.
These standards may specify, for geographic information, methods, tools and services for data management (including definition and description), acquiring, processing, analyzing, accessing, presenting and transferring such data in digital/electronic form between different users, systems and locations.
The work shall link to appropriate standards for information technology and data where possible, and provide a framework for the development of sector-specific applications using geographic data.

Why TC211?

- RLS is based on ISO19xxx series from TC211
- Interoperability with GIS and sensor network systems is important for (Networked) Robots
- Next-generation GIS (such as Ubiquitous Public Access) is emerging in TC211

Current Status

- Liaison between OMG and TC211 underway
  - Discussed at OMG liaison committee in September Tech Meeting (San Antonio)
  - Liaison request letter submitted on 03 Nov
  - Now under default ballot
    - Deadline: 04 Jan, 2010

OBJECT MANAGEMENT GROUP

Mrs. Bjørnhild Sæterøy
Standards Norway
P.O.Box 242
NO-1326 Lysaker
Norway

3rd November 2009

Dear Mrs. Sæterøy

Please accept this request from OMG for a Category A liaison to ISO TC211 in order to participate as appropriate in the work of the TC on standards related to robot location, ubiquitous sensor networks and other next-generation GIS applications.

As you may know, OMG already has an active PAS and ARO relationship with ISO/IEC JTC1, and liaisons of a variety of different categories with several other ISO TCs. A list is available at this URL: http://www.omg.org/news/about/liaison.htm

If the liaison is approved, please name these people as the OMG representatives:

Mr Shuichi Nishio <nishio@ieee.org>
Mr Tom Rutt <tom@coastin.com>
Myself (Andrew Watson) <andrew@omg.org>

Mr. Nishio has expertise in OMG's work on Robotic Location, and would represent OMG's technical interests at TC211, while Mr Rutt and myself would assist on any matters

ISO/TC 211
Geographic information/Geomatics

Internal
Home

About ISO/TC 211
Organization
Programme of work
Models
Terms
Presentations and articles
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Adoption and implementation
User requirements and feedback
Events
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Newsletters
About AJMenu

Norwegian mapping authority
Webmaster:
gerd.mandal@statkart.no
SOSI-secretariat

Open ballots and comments

Comments to the secretariat and to ISO shall be submitted electronically, and the template shall be used for comments on all stages:

Template from ISO for submitting comments - *Please do not alter the table set up. To fill out correctly, see*
User Guide to the Templates for comments
To make it easier to find your comments in the final comments log, and for the editing committee to refer, we recommend that you number your comments in the first column.
Example: NO-1, NO-2 and so on consecutively.

Document	Title	Due date	Ballot/comments	Votings parallel with CEN/TC 287
ISO 19110:2005/ DAmd 1	Geographic information — Methodology for feature cataloguing AMENDMENT 1	2009-12-09	Ballot directly to the ISO Central Secretariat	EN ISO 19110:2006/prA1
N 2776	ISO/CD 19153, Geographic information – Geospatial Digital Rights Management Reference Model (GeoDRM RM)	2009-12-14	Members are requested to use the ISO Internal Balloting System to submit their vote and comments.	
N 2825	Liaison request from the Object Management Group (OMG)	2010-01-04	60 days default ballot. Unless the secretariat hears otherwise, it is assumed that the members are in favour of the liaison.	
N 2790	ISO/CD 19151 Geographic information – Logical location identification scheme	2010-01-05	Members are requested to use the ISO Internal Balloting System to submit their vote and comments.	
N 2838	Proposed dependency matrix of ISO/TC 211 standard	2010-02-07	Any comments should be sent to the secretariat.	
N 2836	ISO/CD 19117 Geographic information – Portrayal	2010-03-04	Members are requested to use the ISO Internal Balloting System to submit their vote and comments.	
N 2809	ISO/TC 211 Standards for systematic review – Upcoming vote on ISO/TS 19138:2006	2010-03-15	Ballot directly to the ISO Central Secretariat.	
			Ballot directly to the ISO Central	

Current Status (cont'd)

- Still not decided how RLS will be standardized in TC211
  - Fast-track or New Item Proposal
- RLS spec under informal review at Programme Maintenance Group (PMG)
- If 'New Item', will be treated in WG10
  - RLS included as one of future item candidates for WG10 (PT19154)

PT19154: Standardization Requirements for Ubiquitous Public Access (draft)

extension Draft document	mechanism to query a resource based on geographic extents, or location name. The geospatial results are based on the GeoRSS standards. Therefore, latitude/longitude order, bounding box parameters, and polygon are all using that standard.	
Robotic Localization Service (RLS)	The Robotic Localization Service (RLS) standard defines specifications for representing and manipulating advanced location measurement results and related information both in static and dynamic manner. In order to achieve high precision or accuracy, modern location data estimation techniques require auxiliary information such as measurement time or error estimation. Aggregation of multiple measurement sources is often required for attaining high precision. And target ID information is required when multiple targets can be measured at once. Also, supports for mobile entities such as navigation robots are required. RLS defines a framework for handling these information that are essential for advanced positioning by extending the existing spatial coordinate standards. Although the specification is named as 'robotic', this specification can be applied to other fields that require advanced location estimation, such as ubiquitous sensor networks or next-generation geographic information systems.	Object Management Group (OMG)

ISO/TC211 WG10

WG10: Ubiquitous public access

- WI 19147 Geographic information - Location Based Services - Transfer Nodes
- WI 19148 Geographic information - Location Based Services - Linear Referencing System
- WI 19151 Geographic information – Logical location identification scheme
- WI 19154 Standardization Requirements for Ubiquitous Public Access
- WI 19155 Geographic information — Place Identifier (PI) Architecture

Convenor: Professor Sang-Ki Hong, South Korea

Contact Report: China/Korea/Japan Workshop

2009. 12. 9.
OMG Robotics DTF
Young-Jo Cho(ETRI)

- The 4-th China/Korea/Japan Joint Workshop on Robotics was held in Beijing, China, on October 27 2009.

- Program was as follows:

October 26, 2009 (Monday)

- **18:30: CKJ Reception**
  Venue: Exhibition Hall, Beijing Xinyuan Hotel

October 27, 2009 (Tuesday)

- **8:30-9:00 Opening Ceremony**
  Chair: Guoqiang Dai
  Speakers: Government delegates from China, Korea and Japan

- **Morning Session: Technologies And Challenges of Emerging Robotics**

  9:00-10:30: Bottle-Neck and Legal Issues of Service Robot Industrialization
  Co-Chairs: Min Tan, Sang-Rok Oh
  (1) Speech 1: Kazuhito Yokoi (AIST, Japan)
  (2) Speech 2: Young Jun Won(Ministry of Knowledge Economics, Korea)
  (3) Speech 3: Tianmiao Wang (Beihang Univ., China)

  10:30-10:45: Coffee Break

  10:45-12:15: New Directions and Challenges of Industrial Robots
  Co-Chairs: Tian Huang, Shigeki Sugano
  (1) Speech 1: Shinsuke Sakakibara (Fanuc, Japan)
  (2) Speech 2: Jong-Seong Hur(Hyndai Heavy Industry, Korea)
  (3) Speech 3: Xijun Deng, Boshi Robotics Technology Co. Ltd., China
- **12:15-14:00 Lunch Break**
  Venue: Exhibition Hall, Beijing Xinyuan Hotel

- **Afternoon Session: Asian Robot Education Working Group Discussion and Exhibition of Educational Robots**
  Co-Chairs: Lining Sun, Tetsuo Kotoku, Young-Jo Cho

  14:00-15:00: Inter-country Cooperation and Robot Education in Asia
  (1) Speech 1: Shuji Hashimoto (Waseda Univ., Japan)
  (2) Speech 2: Hye –Kyung Cho(Hanseong Univ, Korea)
  (3) Speech 3: Ken Chen (Tsinghua Univ., China)

  15:00-16:00: Discussion and Exhibition of Educational Robots
  (1) Speech 1: Robotics Inc., Korea
  (2) Speech 2: ZMP Inc., Japan
  (3) Speech 3: Ye Wang, Uptech Robotics Co. Ltd., China

  16:00-16:15: Coffee Break

- **16:15-17:00: Panel Discussion: Asian Idea and Symbiotic Society with Robots**
  Co-Chairs: Jian Chu, Tianmiao Wang
  Speakers:
  (1) Bo Zhang (Tsinghua Univ., China)
  (2) Tomomasa Sato (Tokyo Univ., Japan)
  (3) Sang-Rok Oh (KIST, Korea)

- **17:00-17:30: Closing Discussion**
  (1) Acknowledgement Speech, Jian Chu (Zhejiang Univ., China)
  (2) Welcome Speech, Sang-Moo Lee (Ministry of Knowledge Economics, Korea): October 2010, KINTEX, Goyang-City

- Call for participation: the 5th Korea–Japan–China Workshop on Robotics in October 2010 (related events: Roboworld 2010)

- Robotics standardization issue will be dealt with in this workshop in near future.

ISO International Organization for Standardization

Contact Report:
ISO/TC184/SC2

Tetsuo Kotoku
AIST, Japan

Schedule

2009 October Meeting:

- WG1 (Vocabulary on robots and robotic devices) : Oct. 22-23
- WG3 (Industrial Safety) :
- WG7 (Personal care safety) : Oct.19-21
- WG7/SG on Medical care robots : Oct.22-24
- WG8 (Service Robots) : Oct.22

at Kikaishinko Bldg., Tokyo, Japan

WG8

- Resolution 76 (Structures within WG 8 – Following 67)
  Study groups on following topics.
  - SG 2(Performance),
  - SG 5(Coordinate systems),
  - SG 6(Robot service contents),
  The call for experts will be made before the next meeting.
- Resolution 78 (Schedule for new proposals)
  Study group leaders are expected to present their initial study results by **Jan. 15, 2010** , after consulting with appointed experts.
- Resolution 83 (Future direction of WG 8)
  We discussed the future directions of WG 8, and decided to continue the discussion at the next meeting.

9 participants (Korea:2, UK:1, France:1, Japan:4, OMG:1)

AIST

Next Meeting

Orlando, FL, USA

- WG1: Feb.11
- WG3: Feb. 8-10
- WG7: Feb.15-17
- WG8: Feb.12

at Shades of Green
(sponsored by RIA)

Future Meetings:
•2010 June meeting will be held in Paris, June 25(Fri), 2010.
• 2010 Fall meeting will be held in a European venue with SC 2 plenary meeting.
•2011 January meeting will be held in New Zealand.

NATIONAL INSTITUTE OF ADVANCED INDUSTRIAL SCIENCE AND TECHNOLOGY (AIST)

robotics/2009-12-20

- OMG Robotics DTF-
- Robotic Functional Services Working Group -

Meeting Report

- Long Beach TC Meeting -

Co-Chairs: Dr. Hori(AIST), Dr. Chi(ETRI)

Long Beach(CA, USA) – Dec 09, 2009

Issue 1 : Name of the Spec

- Name of Spec
  - User Interaction Service for Service Robots(2)
  - Robotic User Interaction Service Framework(0)
  - **TNB : Robotic Interaction Service Framework(8)** stand for RIS
  - Human Robot Interaction Service(0)

Issue 2 : Scope of Standardization

- Interface between Applications and Robotic Components
- Application Domain: Service Robots Interacting with Human-Beings
-

Issue 3 : Standardization Items

- Interface to receive data and control robots
  - Examples: Event, Query and Request
- Data Structure
- Profiles for defining interface

Issue 4 : Steps

1. Case Study
2. Define a Common Framework (Issue 3)
3. Find out Basic Profile Sets
4. Custom Profile Sets

Issue 5 : Homework

1. List up Case Study
   - 15 minutes presentation of each person
     - Hardware Descriptions of Robot
     - Typical Scenario
     - Sequence Diagram
     - Descriptions of Data
     - Application Program Examples (Optional)
     - Meeting Schedule : 2010.01.19-20(in ToKyo)

Roadmap

Roadmap

Item	Status	Long Beach Dec. -2009	Jacksonville March-2009	Minneapolis June.-2009	Boston Sep.-2009
Robotic Interaction Service Framework	On-going	Discussion	1st review of RFP	2nd review of RFP and AB	Initial submission

Infrastructure WG Progress Report
(Long Beach meeting)

Noriaki Ando (AIST)

robotics/09-12-21

Topics of This Meeting

- Reviewing RTC DDR 1st draft by Infra. WG member
  - Term consolidation
  - Review presentation material
- Presentation
  - High-Level Task Description & its Binding APIs for Robots by Dr. Rockwon Kim
- RTC DDR 1st review in the joint plenary meeting with MARS

Reviewing RFP 1st draft

- RT systems
- Robotic systems
- RTC based systems
  - → RTC-based systems
- Robot application
- RT component-based application
  - → RTC-based application
- RTC based application profiles
  - → RTC-based system profile

Object Management Group

140 Kendrick Street
Building A Suite 300
Needham, MA 02494
USA

Telephone: +1-781-444-0404
Facsimile: +1-781-444-0320

RTC Deployment and Dynamic Reconfiguration
(DDR)

Initial Draft Request For Proposal

OMG Document: robotics/2009-11-01

Letters of Intent due: XX June 2010
Submissions due: 23 August 2010

Objective of this RFP

This RFP solicits proposals for the deployment and dynamic reconfiguration of RT components.

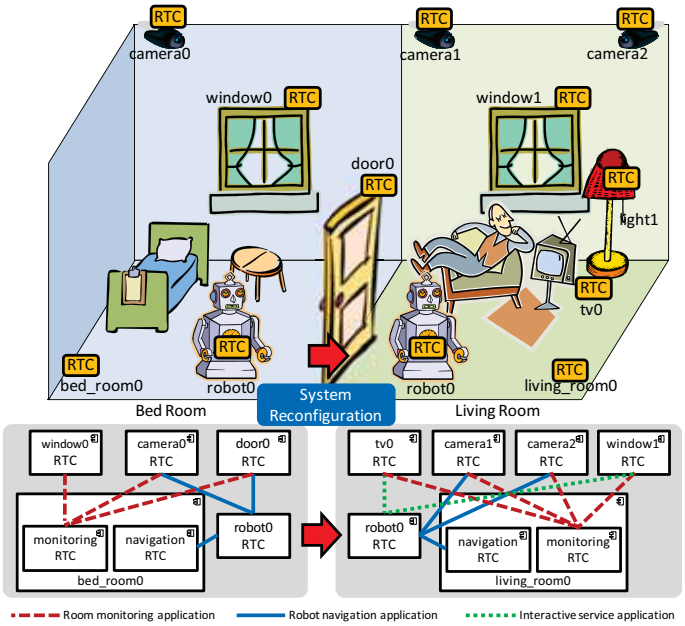
In particular, the proposal shall provide:

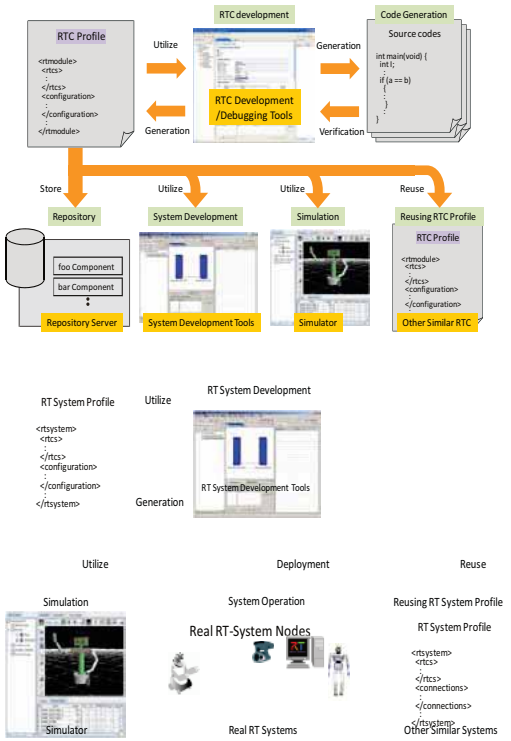
- Descriptions specific to robotics for the deployment of RT components.
- Interfaces for deploying RT components into robotic systems at runtime.
- Methods and interfaces for notifying the relevant RT component instances of environment changes.
- Common methods and interfaces for searching for appropriate RT component instances and dynamically reconfiguring them.

Mandatory Requirements

- Interfaces for storing, searching and retrieving RTCs with RTC profiles
- Interfaces for storing, searching and retrieving RTC-based systems and its profile.
- Interface for RTC deployment into the nodes and the deployment profile.
- Interfaces for RTC registration, searching, discovery and notification of environmental changes.

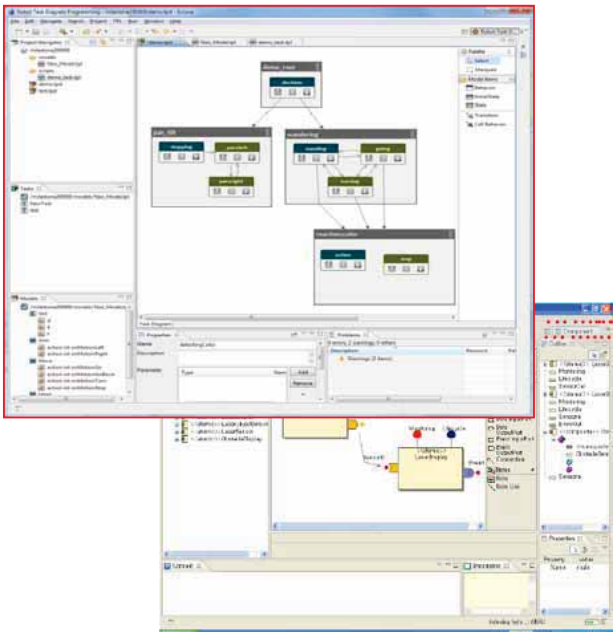
Reviewing RFP 1st draft





Presentation

- High-Level Task Description & its Binding APIs for Robots
  - Task description methods in the OPRoS project in Korea
  - Task/Library/Component
  - Task description model: Behavior, FSM, World model
  - Cf. XABSL, Concrete Syntax For A UML Action Language RFP



Joint plenary meeting with MARS

- Decision
  - This RFP will be issued in MARS
  - 2nd review will be held on Monday morning at the Jacksonville MARS meeting
- Comments
  - Mention or refer OMG D&C specification in the RFP

Schedule

Event or Activity	Actual Date
Preparation of RFP by TF	
RFP placed on OMG document server	*February 22nd, 2010*
Approval of RFP by Architecture Board *Review by TC*	*March, 2010*
TC votes to issue RFP	*March, 2010*
LOI to submit to RFP due	*June, 2010*
Initial Submissions due and placed on OMG document server ("Four week rule")	*August 23rd, 2010*
Voter registration closes	*September, 2010*
Initial Submission presentations	*September, 2010*
Preliminary evaluation by TF	
Revised Submissions due and placed on OMG document server ("Four week rule")	*February 21st, 2011*
Revised Submission presentations	*March, 2011*
Final evaluation and selection by TF *Recommendation to AB and TC*	
Approval by Architecture Board *Review by TC*	
TC votes to recommend specification	*March, 2011*
BoD votes to adopt specification	*June, 2011*

Robotics-DTF Plenary Meeting
Wrap-up Session

December 9th, 2009

Long Beach, CA, USA

Hyatt Regency Long Beach

Document Number

robotics/2009-12-01 Final Agenda (Tetsuo Kotoku)
robotics/2009-12-02 San Antonio Meeting Minutes [approved]
robotics/2009-12-03 Behavioral States and Instructions for Lifestyle Support Service (Miwako Doi)
robotics/2009-12-04 Steering Committee Presentation (Tetsuo Kotoku)
robotics/2009-12-05 Roadmap for Robotics Activities (Tetsuo Kotoku)
robotics/2009-12-06 High Level Task Description for Robotics (Rockwon Kim)
robotics/2009-12-07 Binding Symbols/Functions/Actions in World Model to APOIs (Rockwon Kim)
robotics/2009-12-08 OPRoS Component Tools = Snapshots = (Seung Woog Jung)
robotics/2009-12-09 RTC Deployment and Dynamic Reconfiguration RFP Draft [for 1st review revised version] (Noriaki Ando)
robotics/2009-12-10 OMG User Identification Service Interface (Su-Young Chi and Jaeyeon Lee)
robotics/2009-12-11 Scope of Standardization for UIS (Su-Young Chi and Jaeyeon Lee)
robotics/2009-12-12 Case Stady: UIS (JaeYeon Lee)

Document Number (cont.)

robotics/2009-12-13 Introduction to DDS (Rick Warren)
robotics/2009-12-14 Opening Presentation (Tetsuo Kotoku)
robotics/2009-12-15 Introduction of ISO/IEC JTC1/SC24 (Yun Koo Chung)
robotics/2009-12-16 RTC Deployment and Dynamic Reconfiguration (DDR) 1st draft [mars/2009-12-15] (Noriaki Ando)
robotics/2009-12-17 Contact Report: Status of Robotic Localization Service (RLS) in ISO/TC211 (Shuichi Nishio)
robotics/2009-12-18 Contact Report: China/Korea/Japan Workshop (Young-Jo Cho)
robotics/2009-12-19 ISO/TC184/SC2 (Tetsuo Kotoku)
robotics/2009-12-20 Robotic Functional Services WG Report (Su-Young Chi)
robotics/2009-12-21 Infrastructure WG Report (Noriaki Ando)
robotics/2009-12-22 Wrap-up Presentation (Tetsuo Kotoku)
robotics/2009-12-23 Next Meeting Preliminary Agenda - DRAFT (Tetsuo Kotoku)
robotics/2009-12-24 DTC Report Presentation (Young-Jo Cho)
robotics/2009-12-25 Charter for Robotics Localization Service (RLS) RTF (Shuichi Nishio)
robotics/2009-12-26 Long Beach Meeting Minutes - DRAFT (Geoffrey Biggs and Rockwon Kim)

Organization

Robotics-DTF
- Laurent Rioux (Thales)
- Tetsuo Kotoku (AIST, Japan)
- Young-Jo Cho (ETRI, Korea)

Steering Committee — All volunteers

Publicity Sub-Committee
- Abheek Bose (ADA Software, India)

Contacts Sub-Committee
- Makoto Mizukawa (Shibaura-IT, Japan)
- Young-Jo Cho (ETRI, Korea)
- Yun Koo Chung (ETRI, Korea)

Technical WGs

Infrastructure WG
- Noriaki Ando（AIST, Japan)
- Beom-Su Seo (ETRI)

Robotic Functional Services WG
- Su-Young Chi (ETRI, Korea)
- Shuichi Nishio (JARA/ATR, Japan)
- Toshio Hori (AIST, Japan)

Robotic Data and Profiles WG
- Bruce Boyes (Systronix, USA)
- Laurent Rioux (Thales)

Robotic Localization Services WG
- Jaeyeong Lee (ETRI, Korea)
- Yeon-Ho Kim (Samsung, Korea)
- Shuichi Nishio (JARA/ATR, Japan)

Next Meeting Agenda

March 22-26 (Jacksonville, FL , USA)

Monday:

Steering Committee (morning)
RTC Deployment and Dynamic Reconfiguration RFP
2nd Review and Voting (am)
WG activity (pm)

Tuesday:

WG activity (am)
Robotics-DTF Plenary Meeting (pm)
- **Guest and Member Presentation**
- **Contact reports**

Wednesday:

WG activity follow-up [if necessary]

Thursday:

RTC Deployment and Dynamic Reconfiguration RFP
2nd Review and Voting (am)

AIST

Plenary Attendee (17 participants)

- Akira Tanaka (View5)
- Chul Jong Hwang (KAR)
- Geoffrey Biggs (AIST)
- JaeYeon Lee (ETRI)
- Myung-Eun Kim (ETRI)
- Noriaki Ando (AIST)
- Rick Warren (RTI)
- Rockwon Kim (ETRI)
- Seung-Woog Jung (ETRI)
- Shuichi Nishio (JARA/ATR)
- Su-Young Chi (ETRI)
- Takashi Tsubouchi (Univ. of Tsukuba)
- Takeshi Sakamoto (Technologic Arts)
- Tetsuo Kotoku (AIST)
- Toshio Hori (AIST)
- Young-Jo Cho (ETRI)
- Yun Koo Chung (ETRI)

NATIONAL INSTITUTE OF ADVANCED INDUSTRIAL SCIENCE AND TECHNOLOGY (AIST)

Robotics Domain Task Force Preliminary Agenda ver0.0.1 **robotics/2009-12-23**

OMG Technical Meeting - Jacksonville, FL, USA -- March 22-26, 2010

http://robotics.omg.org/

		TF/SIG				
		Host	Joint (Invited)	Agenda Item	Purpose	Room
Monday: Robotics Plenary(am) and WG activites(pm)						
9:00	9:45			Robotics Steering Committee	Arrangement	
9:45	10:00	Robotics		Robotics-DTF Plenary Opening Session	Robotics plenary openning	
10:00	11:00	MARS		RTC Deployment and Dynamic Reconfiguration RFP 2nd Review (at MARS-PTF: time slot is not decided yet) - Noriaki Ando(AIST) and Beom-Su Seo (ETRI)	presentation, discussion, Vote-to-vote and Voting	
11:00	12:00			Robotic UML Profiling Meeting (1h) - Laurent Rioux (Thales)	discussion	
12:00	13:00					
13:00	18:00			Architecture Board Plenary		
13:00	18:00			Robotic Infrastructure WG (5h) - Noriaki Ando and Beom-Su Seo	discussion	
Tuesday: WG activities (am) and Robotics Plenary (pm)						
9:00	12:00			Robotic Infrastructure WG (3h) - Noriaki Ando and Beom-Su Seo	discussion	
				Robotic Functional Services WG(3h): - Su-Young Chi(ETRI), Hyunsoo Kim(Samsung) and Toshio Hori(AIST)	discussion	
12:00	13:00			**LUNCH**		
13:00	14:00	Robotics		**Special Talk:** - TBA	presentation and discussion	
14:00	15:00	Robotics		**Ist Review: Robotic Interaction Service Framework RFP (tentative)** - Su-Young Chi and Toshio Hori	presentation and discussion	
				Break (30min)		
15:30	16:30	Robotics		WG Reports and Discussion (Service WG, Profile WG, Robotic Localization Service WG)	presentation and discussion	
16:30	17:10	Robotics		Contact Reports: - Makoto Mizukawa(Shibaura-IT), and Young-Jo Cho(ETRI)	Information Exchange	
17:10	17:40	Robotics		Robotics-DTF Plenary Wrap-up Session (Roadmap and Next meeting Agenda)	Robotics plenary closing	
17:40				Adjourn joint plenary meeting		
17:40	18:00			Robotics WG Co-chairs Planning Session (Preliminary Agenda for next TM, Draft report for Friday)	planning for next meeting	
Wednesday WG activity follow-up						
9:00	12:00			Robotic Infrastructure WG (3h) - Noriaki Ando and Beom-Su Seo	discussion	
				Robotic Functional Services WG(3h): - Su-Young Chi, Hyunsoo Kim and Toshio Hori	discussion	
12:00	14:00			**LUNCH and OMG Plenary**		
14:00	18:00			Robotic Infrastructure WG (4h) - Noriaki Ando and Beom-Su Seo	discussion	
				Robotic Functional Services WG(3h): - Su-Young Chi, Hyunsoo Kim and Toshio Hori	discussion	
18:00	20:00			**OMG Reception**		
Thursday Robotics-DTF Plenary						
9:00	10:00	MARS		Robotics-DTF Joint Plenary with MARS (at MARS-PTF: time slot is not decided yet) Voting of RTC Deployment and Dynamic Reconfiguration RFP	Voting	
12:00	13:00			**LUNCH**		
13:00	18:00			Architecture Board Plenary		
Friday						
8:30	12:00			AB, DTC, PTC		
12:00	13:00			**LUNCH**		

Other Meetings of Interest

Monday						
8:00	8:45	OMG		New Attendee Orientation		
18:00	19:00	OMG		New Attendee Reception (by invitation only)		

Please get the up-to-date version from http://staff.aist.go.jp/t.kotoku/omg/RoboticsAgenda.pdf

Robotics-DTF

Date: Friday, 11th December, 2009
Chair:, T. Kotoku, Y. –J. Cho and L. Rioux
URL: http://robotics.omg.org/
email: robotics@omg.org

➢Highlights from this Meeting:

Robotics Plenary: (17 participants)

- 1 New Work Item Talks
  - "Behavioral states and instructions for lifestyle support service", Miwako Doi, Toshiba [robotics/2009-12-03]
- 1 Special Talk
  - "Introduction to DDR(Data Distribution Service", Rick Warren, RTI [robotics/2009-12,13]
- 2 WG Reports [robotics/2009-12-20,-21]
- 4 Contact Reports [robotics/2009-12-15,-17,-18,-19]
- Preliminary agenda for upcoming meeting [robotics/2012-12-23]

Robotics-DTF

Date: Friday, 11th December, 2009
Chair:, T. Kotoku, Y. –J. Cho and L. Rioux
URL: http://robotics.omg.org/
email: robotics@omg.org

➢Deliverables from this Meeting:

- Nothing Special

➢Future deliverables (In-Process):

- RTC DDR(Deployment and Dynamic Reconfiguration) thru MARS-PTF
- Robotic Interaction Service Framework RFP

➢Next Meeting (Jacksonville, FL):

- 2nd Review of RTC DDR RFP
- 1st Review of User Interaction Service Framework RFP
- Guest presentations
- Roadmap discussion
- Contact reports

Proposed Charter for Robotic Localization Service (RLS) RTF

TC Meeting Date: 11 December, 2009
Presenter: Young Jo-Cho, ETRI
Group email: rls-rtf@omg.org
WIP page (URL): http://www.omg.org/techprocess/meetings/schedule/RLS_RTF.html

- **Available Specification:**
  - dtc/09-06-04
  - dtc/09-06-07 (XMI file)
  - dtc/09-06-06 (C++ PSM header files)
- **Members:**
  - Itsuki Noda, AIST
  - Wonpil Yu, ETRI
  - Saku Egawa, Hitachi
  - Shuichi Nishio (Chair), JARA
  - Yeon-Ho Kim, Samsung Electronics
  - Makoto Mizukawa, Shibaura Institute of Technology
  - Takeshi Sakamoto, Technologic Arts Inc.
  - Takashi Tsubouchi, University of Tsukuba
- **Deadlines:**
  - Comments Due: 14 December, 2010
  - Report Due Date: 22 February, 2011
  - Report Deadline: 1 April, 2011

Minutes of the Robotics DTF Meeting - DRAFT

December 7-11, 2009

Long Beach, CA, USA

(robotics/2009-12-26)

Meeting Highlights

- The 1st draft of "RTC deployment and Dynamic Reconfiguration RFP" was reviewed at the Joint Plenary with MARS and at the upcoming Long Beach Meeting. [robotics/2009-12-09]
- As a potential new work item, New Work Item Talks "Behavioral states and instructions for lifes tyle support service" was presented by Dr. Miwako Doi (Toshiba) [robotics/2009-12-03]
- As a special talk, "Introduction to DDR(Data Distribution Service" was presented by Dr. Rick W arren (RTI) [robotics/2009-12-13]
- Liaison between OMG and TC211 underway [robotics/2009-12-17]

List of Generated Documents

robotics/2009-12-01 Final Agenda (Tetsuo Kotoku)
robotics/2009-12-02 San Antonio Meeting Minutes [approved]
robotics/2009-12-03 Behavioral States and Instructions for Lifestyle Support Service (Miwako Doi)
robotics/2009-12-04 Steering Committee Presentation (Tetsuo Kotoku)
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robotics/2009-12-19 Contact Report: ISO/TC184/SC2 (Tetsuo Kotoku)
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robotics/2009-12-25 Charter for Robotics Localization Service (RLS) RTF (Shuichi Nishio)
robotics/2009-12-26 Long Beach Meeting Minutes - DRAFT (Geoffrey Biggs and Rockwon Kim)

Minutes
Wednesday, December 10, 2009, Regency C, 3rd Floor
Robotics DTF Plenary Meeting,

14:00 - 14:10 Opening Session Chair: Dr Kotoku, Quorom: 4

Joined organizations: AIST, ETRI, JARA, Technologic Arts, KAR, View Five
- Minutes takers: Geoffrey Biggs (AIST), Rockwon Kim (ETRI)
- Approval of San Antonio minutes
  - Correction: Document 2009-09-14 was submitted by Dr. Hori (AIST)
  - Approved: AIST (motion), ETRI (second), JARA (white ballot)

14:10 - 15:20 Special talk: Introduction to DDS (Rick Warren, RTI)

- DDS has two parts:
  - Data Distribution Service for real-time systems.
  - Real-Time Publish-Subscribe (RTPS) Protocol (sometimes also called DDSI).
    - No other publisher-subscribe system has this sort of protocol.
- Several implementations of DDS and RTPS, including commercial and open-source.
- Used in a wide range of commercial control projects (military, driver safety systems, telescope control, MRI, PLCs, ...)
- Publish-Subscribe model, data-centric.

15:20 - 15:40 Contact report, Yun Koo Chung, ETRI

- Introduction to ISO/IEC JTC1/SC24
  - Joint Technical Committee of IEC and ISO 1: "Information Technology"
  - SC24: Computer graphics, image processing and environmental data representation.
- Yun Koo Chung was appointed as liaison to the OMG Robotics RTF by WG7.
  - Liase about standardization of imaging based applications for service robotics.
  - See document ISO/IEC JTC1 SC24N3182.
  - ETRI (motion), AIST (second), JARA (white ballot)

16:00 - 17:40 Joint Plenary with MARS

RTC Deployment and Dynamic Configuration RFP, Noriaki Ando, AIST
- Common services and interfaces for component repositories, searching, deployment, directory services, and detecting/notifying of changes in components are needed.
- Will be issued as a MARS RFP.
- Revise the RFP to call for a PSM based on the DnC PIM, extending it to add in the extra features not found in that model that are necessary for the RFP.
- Document number: MARS-2012

16:50 - 17:00 Contact report, Shuichi Nishio, JARA

Status of Robotic Localization Service at ISO/TC211
- Liaison between OMG and TC211 underway.
- Still not decided how the RLS will be standardized in TC211.
  - Fast-track or New Item Proposal.
- RLS spec under informal review at PMG.

- If "New Item", will be handled by WG10 (Ubiquitous Public Access).

17:00 - 17:08 Contact report, Young-Jo Cho, ETRI

4th China/Korea/Japan Joint Workshop on Robotics
- Service robot industrialization.
- Challenges of industrial robots.
- Discussion and exhibition of educational robots.
- Next workshop will be held in Korea.

17:08 - 17:10 Contact report, Tetsuo Kotoku, AIST

ISO/TC184/SC2 2009 Oct. Tokyo Meeting
- WG8: Setting up 3 Study Groups

17:10 - 17:20 User Identification Service WG report

- Discussed the name of the specification.
  - Voted for Robotic Interaction Service Framework (RIS) with 8 votes.
- Discussed the scope of standardization.
  - Application domain: service robot interacting with humans.
- Discussed standardization items.
- Discussed 4 steps to standardization. First is case studies.
- Will meet 19th and 20th January in Tokyo to present case studies.
- Roadmap: 1st review of RFP in March 2009, 2nd review in June 2009, submission in Sept ember 2009.

17:20 - 17:30 Infrastructure WG report

- Reviewing RTC DDR 1st draft.
  - Term consolidation and review presentation material.
- Presentation on High-Level Task Description and its Binding APIs for Robotics by Dr Rock won Kim.
- Joint plenary with MARS reviewing RFP 1st draft.
- Will submit 2nd RFP on February 22, 2010.
- Will be issued as a MARS RFP.

17:30 - 17:40 Closing presentation and next agenda by Tetsuo Kotoku

- Chair change in Infrastructure WG.
- Roadmap discussion.
  - Robotic Map Services RFP is still under discussion.
  - Behavior States and Instructions RFP was proposed.
- New member on the Contacts Sub-committee: Yun Koo Chung, ETRI
- Next meeting: March 22-26, Jacksonville, FL, USA.

Adjourned plenary meeting at 17:40

ATTENDEE (17 Participants)

- Akira Tanaka (View5)
- Chul Jong Hwang (KAR)
- Geoffrey Biggs (AIST)
- JaeYeon Lee (ETRI)
- Myung-Eun Kim (ETRI)
- Noriaki Ando (AIST)
- Rick Warren (RTI)
- Rockwon Kim (ETRI)
- Seung-Woog Jung (ETRI)
- Shuichi Nishio (JARA/ATR)
- Su-Young Chi (ETRI)
- Takashi Tsubouchi (Univ. of Tsukuba)
- Takeshi Sakamoto (Technologic Arts)
- Tetsuo Kotoku (AIST)
- Toshio Hori (AIST)
- Young-Jo Cho (ETRI)
- Yun Koo Chung (ETRI)

Prepared and submitted by Geoffrey Biggs(AIST) and Rockwon Kim (ETRI).